- Take the pattern blocks and change the unit whole. For example: two yellow hexagons equal one. What would be the value of the other pieces?
- Have students create a design with pattern blocks. What is the design's value if the unit whole is the green triangle?

Family Connections

Home Fraction Hunt:

- What are the most common fractions found in the home?
- Where are most of the fractions found in your home?

Additional Resources

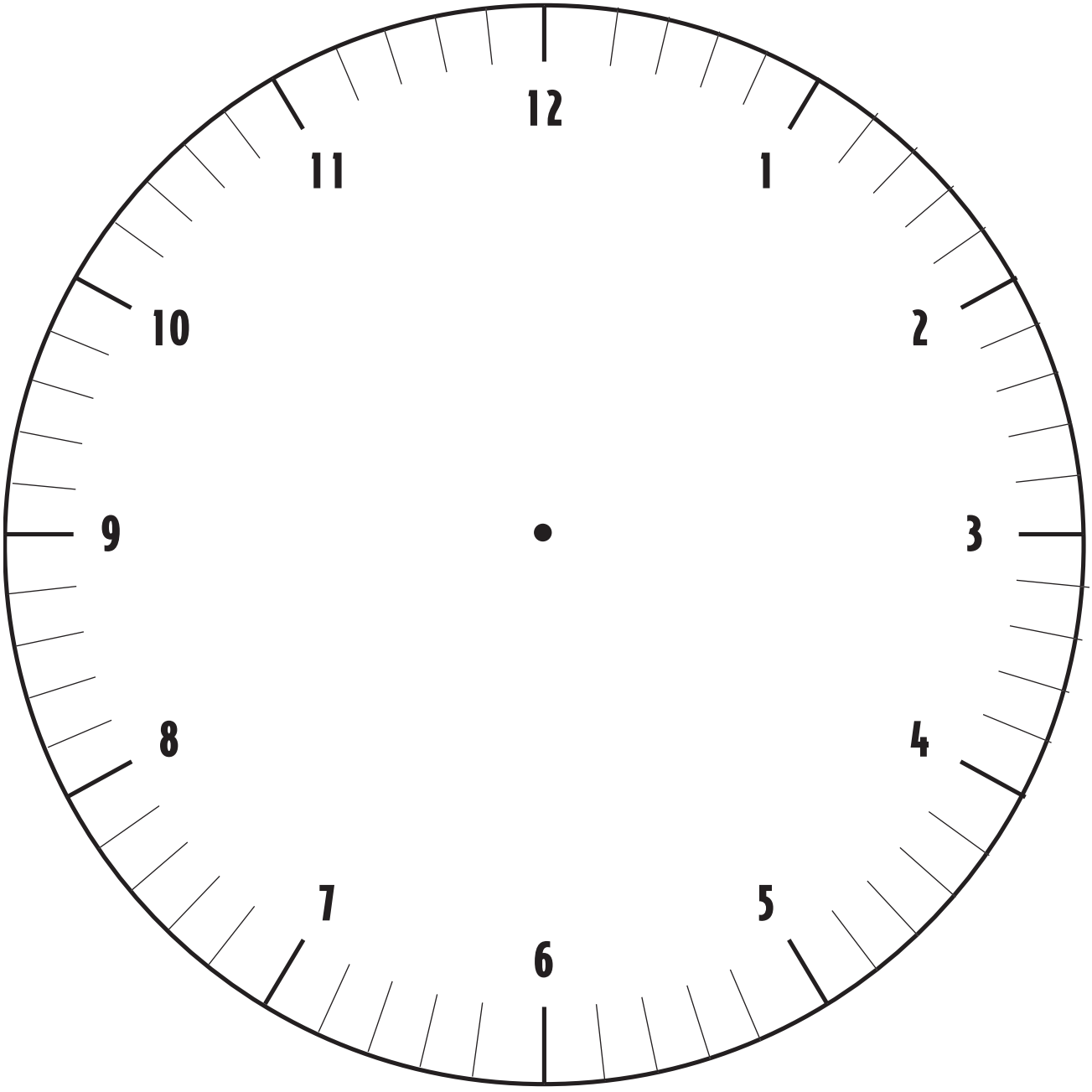
Web sites

Interactive math practice for elementary students www.mathplayground.com/Fraction_Bars.html

Interactive lessons and explorations and information about fraction bars for students, teachers, and people of all ages in mathematics and science. www.fractionbars.com

The Musical Fraction Bars activity connects your knowledge of fractions and length to ... How to play Musical Fraction Bars: Scroll down until you see the ... www.philtulga.com/fractionbars.html

Clock



Cake

Can You Make?

Can You Make?	with wholes	with halves	with thirds	with fourths	with fifths	with sixths
1						
1/2						
1/3						
1/4						
1/5						
1/6						
1/7						
1/8						
1/9						
1/10						
1/11						
1/12						

Can You Make?

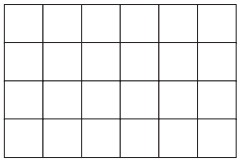
Can You Make?	with sevenths	with eighths	with ninths	with tenths	with elevenths	with twelfths
1						
1/2						
1/3						
1/4						
1/5						
1/6						
1/7						
1/8						
1/9						
1/10						
1/11						
1/12						

Share Equally

Share each of the items below as directed. Be prepared to explain how you did the sharing.

3

4



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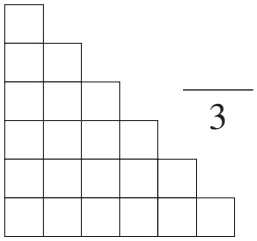

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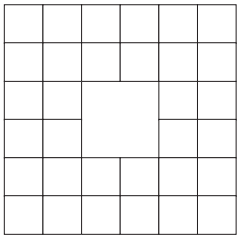

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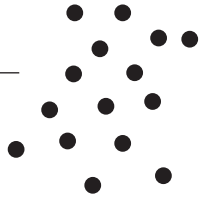

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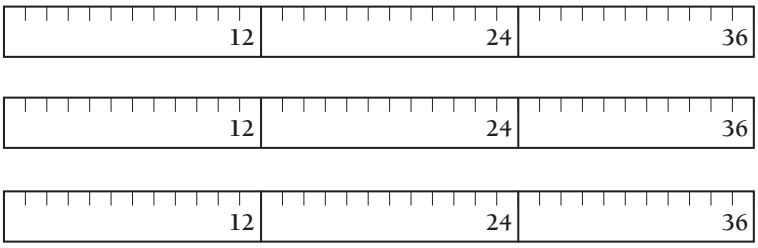

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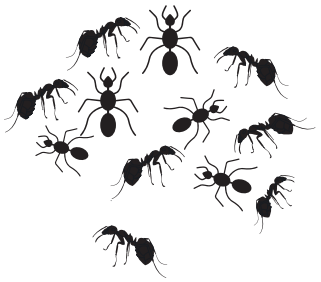

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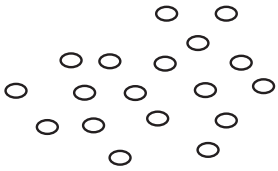

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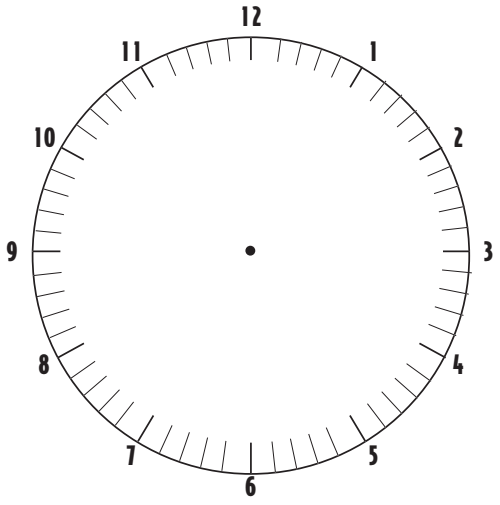

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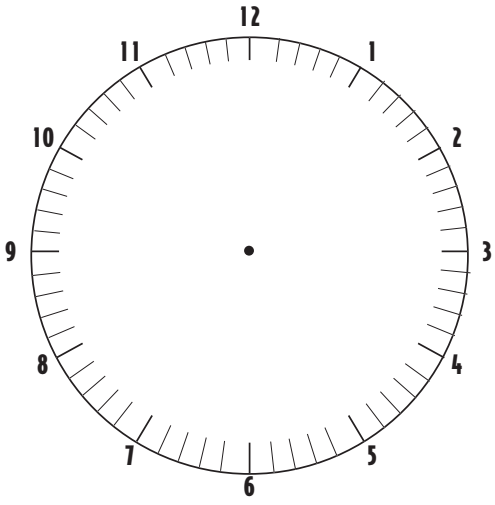
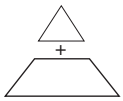
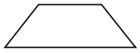
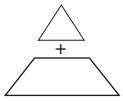
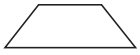


5

"If This Is...?

Challenge yourself to find the answers without using pattern blocks. Then if you need check with pattern blocks. Happy thinking!

If  is					
1/2					
1/4					
1/8					

If  is					
1					
2					
1/2					

Tangram Toil

Math Standard I

Objective 2

Connections

Standard I:

Students will expand number sense to include integers and perform operations with whole numbers, simple fractions, and decimals.

Objective 2:

Explain relationships and equivalencies among integers, fractions, decimals, and percents.

Intended Learning Outcomes:

2. Become effective problem solvers by selecting appropriate methods employing a variety of strategies, and exploring alternative approaches to solve problems.
3. Reason logically using inductive and deductive strategies and justify conclusions.
4. Communicate mathematical ideas and arguments coherently to peers, teachers, and others using the precise language and notation of mathematics.

Content Connections:

Math II-1; recognize, analyze, and use patterns

Background Information

Students should be comfortable with "sharing equally." This activity provides students experience with more physical models. The more rich area, set, and length models provided, the more meaning for the students. Tangram Toil makes the transition to algorithms more successful. This will give them an opportunity to apply and practice what they understand about equivalence, fractional relationship to the unit whole, use fraction vocabulary, and create the concrete representation.

Research Basis

Solomon, M., & Hendren, R. (2003). A critical look at brain-based education. *NAESP Middle Matters.* 12(1).

This article addresses new brain research in respect to how children learn. Quantitative thinking requires many different component skills, including decoding of symbols, understanding quantities, counting ability, representing abstract objects, and understanding part-whole relationships. Math teaching strategies need to help students develop representations of number-related concepts, transfer lower-level rote math skills to higher-level problem solving, and generate multiple solutions to problems. This article discusses the importance of simulations, role-play, hands-on activities, collaborative decision-making, group problem solving, and movement for the formation of complex neural connections in the brain.

Green, F.E. (2006). Brain and learning research: Implications for meeting the needs of diverse learners. *Education*. 119(4).

This extensive research article provides implications of meeting the needs of the diverse learners in the classroom. It shares dramatic developments related to brain structure, multiple intelligences, learning styles, emotions and learning, music and cognitive development, and brain-based learning.

Invitation to Learn

Materials

- ❑ Bike picture/cards
- ❑ *Bikes*

As students enter the room they will find various bike picture cards on their desks. Invite students to look over the bike cards, and complete the *BIKE* worksheet provided for them at their desks. Follow with a class discussion of results and ask other probing questions to assess understanding. Pose the opportunity for students to offer questions of fractional relationships with the bikes.

Instructional Procedures

Materials

- ❑ Tangram manipulatives
- ❑ Milky Way miniature candy bars
- ❑ *Milky Way Fraction Hunt*
- ❑ Journal

1. Provide a group of students, pairs of students, or individual students with a tangram manipulative. This will depend on the amount of tangram sets you have.
2. Challenge the students to put the tangram pieces together to form a square. This may take awhile.
3. Once assembled they are to find the fractional value of each of the tangram pieces. Assume that the original square is the whole or one.
4. An additional challenge depending on the students' prior knowledge of decimals would be to refer to the whole as 1.00 or $1.00. Then challenge them to find the decimal value of each tangram piece. This provides an opportunity to practice fraction to decimal relationships.
5. Another challenge would be to change the unit whole. The large right triangle could become the area whole.

Assessment Suggestions

- *Milky Way Fraction Hunt* has a built in self-assessment.
  1. Provide the *Milky Way Fraction Hunt* worksheet on each students' desk.
  2. Place a basket or box of miniature Milky Way bars under the South Pole of a globe in the room prior to students arriving.

Hopefully not too obvious to students' sight as students will decode the clues and follow directions to the candy bars.

Curriculum Extensions/Adaptations/ Integration

- Brain storm and/or provide a list of suggestions of real world fraction opportunities.

The list might resemble: class members, physical classroom, one student's outfit, teachers in building, shoes on students, vowels/ consonants in names, M&M candies in a bag, Skittles in a bag, handful of Fruit Loops cereal, Valentines candies, cars in parking lot, lunch items on plate (carbs/proteins), assignment scores, opinions, and so forth.

As a writing extension have students write their own fraction problem about one of the suggestions in the list. Write the problem on a sheet of paper. Sign your name and add to a class set of problems in book form, exchange with a classmate for them to solve, or use in a center.

Family Connections

- Challenge students to write a fraction hunt (like *Milky Way Fraction Hunt*) of their own to share with the class.

Additional Resources

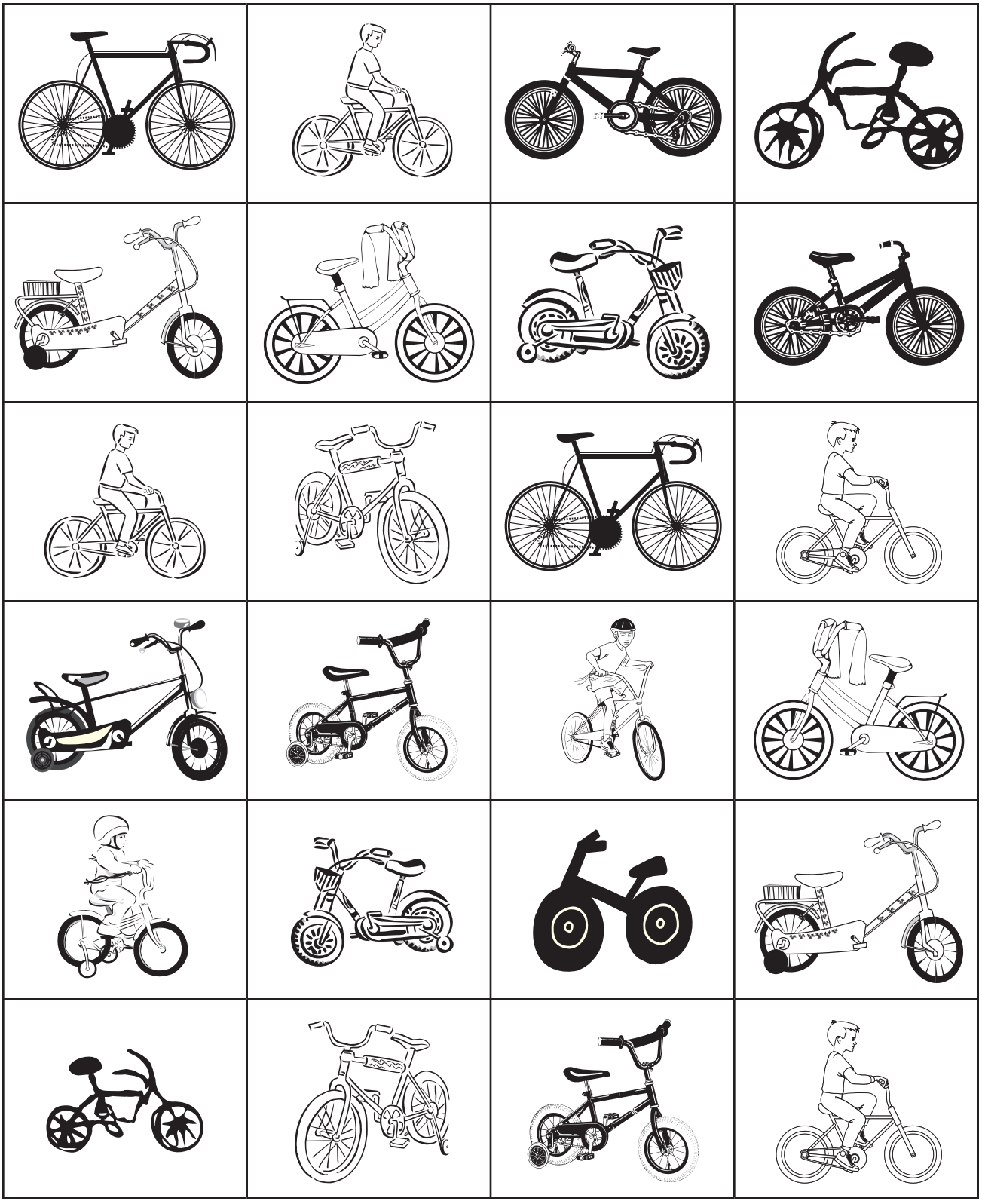
Web sites

Tangrams and Fractions ...

www.pbs.org/teachersource/mathline/concepts/asia/

www.europa.com/~paulg/mathmodels/frac_area.html

BIKE Picture Cards



BIKES

What is the whole unit that you are considering? _____

What fraction of the bikes are mountain bikes? _____

What fraction of the bikes have gears? _____

What fraction of the bikes have training wheels? _____

The boy style frames on the bikes represent _____ of the bikes.

How many of the handle bars have streamers on them. _____

How many of the bikes have fenders? _____

Make **two** true statements about the bike colors using the terms: **half, third, fourth, fifth, sixth, eighth, and/or tenth.**

1._____

_____

_____

2._____

_____

_____

BIKES

What is the whole unit that you are considering? _____

What fraction of the bikes are mountain bikes? _____

What fraction of the bikes have gears? _____

What fraction of the bikes have training wheels? _____

The boy style frames on the bikes represent _____ of the bikes.

How many of the handle bars have streamers on them. _____

How many of the bikes have fenders? _____

Make **two** true statements about the bike colors using the terms: **half, third, fourth, fifth, sixth, eighth, and/or tenth.**

1._____

_____

_____

2._____

_____

_____

Name _____ Date _____

Milky Way Fraction Hunt

Write the appropriate parts of the words on the line to form a new word.

1. The first half of food + the last quarter of door.

_____

2. The last third of hat + the first 2/5 of heavy.

_____

3. The second 1/3 of office + the last 1/4 of door + the first 1/3 of street.

_____

4. The last half of go + the last 1/2 of done.

_____

5. The last 1/8 of elephant + the first 1/5 of order.

_____

6. The first 3/4 of fine + the last 3/4 of dish.

_____

7. The last 1/6 of cement + the first of 3/7 of history.

_____

8. The last half of bath + the finest 1/3 of end + the last 2/7 of require.

_____

9. The first 2/5 of water + the last 3/4 of fits.

_____

10. The last 1/6 of Glenda.

_____

11. The first 1/3 of principal + the first half of zero.

_____

12. The first 1/7 of instant + the first third of fat.

_____

13. The first 2/5 of young + the first 1/10 of understand.

_____

14. The first 1/4 of ugly + the first 1/5 of settlement.

_____

15. The first 1/4 of youthful + the last half of pour.

_____

16. The first 1/4 of hesitate + the last 2/3 of sad.

_____

17. The last 1/3 of rat + the first 2/5 of heart.

_____

18. The first 3/7 of mileage + the last 2/3 of sky.

_____

19. The first 1/5 of white + the last 1/3 of Friday.

_____

20. The last 1/4 of Meri + the first 1/5 of Susan.

_____

21. The first 3/5 of dirty + the last 3/7 of perfect + the first 2/5 of Lynda.

_____

22. The first 3/4 of bent + the last 2/3 of breath.

_____

23. The first 1/3 of Thomas + the first 1/8 of Endicott.

_____

24. The first 3/5 of sound + the last 2/9 of Aylsworth.

_____

25. The first quarter of positive + the first two thirds of Lee.

_____

26. The first 3/5 of quick + the second 1/4 of meat + the last 1/3 of patiently.

_____

27. The first third of get + the second fourth of Jody.

_____

28. The first half of loud + the last half of book.

_____

Write the clues in numerical order:

_____

_____

_____

The ANSWER KEY for the activity is: FOR THE FIRST ONE TO FINISH THIS THERE WAITS A PRIZE IF YOU USE YOUR HEAD THE MILKY WAY IS DIRECTLY BENEATH THE SOUTH POLE QUIETLY GO LOOK

Math IV-1&2

Activities

Measurable Attributes

What's Inside?

Standard IV:

Students will determine area of polygons and surface area and volume of three-dimensional shapes.

Objective 1:

Determine the area of polygons and apply to real-world problems.

Intended Learning Outcomes:

2. Become effective problem solvers by selecting appropriate methods, employing a variety of strategies, and exploring alternative approaches to solve problems.
5. Connect mathematical ideas within mathematics, to other disciplines, and to everyday experiences.

Content Connections:

Math III-1 Analyze attributes of geometric shapes
Language Arts VIII-2; compose written work

Math Standard IV

Objective 1

Connections

Background Information

This lesson is an opportunity for students to explore area without the requirement of a formula to determine the area of a polygon. These hands-on activities will help students understand the concept of area. Students need to understand that area is the number of square units inside a flat, two-dimensional figure. Math concepts such as area can be abstract and hard to understand. Teaching area from a non-formula basis helps the understanding of the concept become more concrete, making the transition to using a formula easier. Finding the area of an irregular figure requires students to decompose the figure into smaller rectangles or triangles, finding the area of the smaller figures and then adding.

Before beginning this lesson, students should be able to easily identify and name different polygons. It will help if students have worked with polygons in composing other shapes. This lesson serves as a good introduction into area and the determination of such based on a predetermined square unit. By using paper tiles to represent one square unit, students are constructing their own mathematical understanding of area. Practicing with the area of polygons, sets up students for success in developing an understanding of the surface area of a three dimensional solid.

Research Basics

Moyer, P. (2004). Controlling choice: teachers, students and manipulatives in mathematics classrooms. *School Science and Mathematics.* 104(1). 16-32.

This research study of instructional practices of teachers shows those who demonstrate the use of manipulatives as a tool for better understanding of concepts and allow access to manipulatives often are opening doors for students struggling with abstract concepts. Allowing the use of manipulatives encourages student ownership of strategies, ideas, and processes and gives students a strong conceptual base on which they can begin to construct higher mathematical thinking.

Furner,J., Yahya, N., Duffy M.L. (2005). 20 Ways to teach mathematics: strategies to reach all students. *Intervention in School and Clinic.* 41(1). 16-23.

Educators must make every effort to ensure all students have equal access to learning mathematics. Incorporating multiple intelligences enables all learners the opportunities to develop mathematically. Applying skills to a problem-solving task benefits learners in later applying information to real life situations.

Invitation to Learn

Materials

- ❑ Tangram sets
- ❑ Tangram shape laminated cards

Provide small groups or pairs of students with a set of tangrams and a laminated card with a shape on it. Pairs will try to reproduce the shape with no overlapping pieces from the tangram set. This activity leads right into a discussion of what area is and how is it determined.

Instructional Procedures

Materials

- ❑ Math journal
- ❑ Pencil
- ❑ *Pezzettino*
- ❑ Various 1 cm paper tiles
- ❑ *One-on-the-Mountain*
- ❑ Glue sticks
- ❑ Tangram sets
- ❑ Overhead tangram set

1. Read *Pezzettino* to students, emphasizing the illustrations.
2. Discuss and define area with students as the number of square units inside a figure. Share with students that we are finding area without the use of a formula. Also revisit polygons to clarify student understanding.
3. Hand out *One-on-the-mountain* from the story and colored paper tiles. Using the tiles, have students fill in the area of the animal and determine the number of square units used, or area. Students will record area on bottom of sheet and attach to journal.
4. Handout sets of tangrams to individual students.
5. Starting with the small square, trace around shape in journal. Assign the square the area of one square unit. Write one square unit next to the square.
6. Using overhead tangrams, make a square with the two small congruent triangles. Ask students what the area of the square

is? What would the area of one triangle be? Trace around one of the congruent triangles and label the area next to it.

7. Continue on for each different piece within the tangram set. Remind students to label the area for each shape. Allow students time to discover the make-up of each shape.
8. Discuss how area of different shapes can be determined with tangrams. Help students having trouble with the building or visualization of filling the area with other shapes.
9. Students will now be able to make any polygon with the tangrams and determine the area. Each person will design a polygon for a partner to determine the area. Students will trade polygons and determine the area.
10. Allow several pairs to share a polygon, using the overhead tangrams, with the class.
11. Using an overhead tangram set, display a trapezoid. As a class have students determine the area of a trapezoid using the overhead tangram pieces.
12. In Math Journal have students construct and trace their trapezoid. Have students trade journals and determine the area.

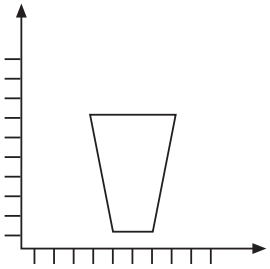
Assessment Suggestions

- Assess ability to determine area by supplying tangram silhouette and assigning a random unit for the square.
- Math journal–examples of polygons with area determined.
- Repeat the same steps with the tangram, changing the square unit to another number such as 3.
- Observation and discussion of the activity.
- Journaling–Ask students to define area and explain one way to determine area.

Curriculum Extensions/Adaptations/ Integration

- Using black line tangram animal figures from the Invitation to Learn, determine the area.
- Special needs students may glue down tangram paper tiles to determine area.
- Use this lesson as a first step in helping students discover their own formula for area.

- Measure the actual area of each tangram piece and chart results of measurements.
- Have students build their own tangram shape, specify a square unit and have a partner determine the area.
- Apply to real life situations by determining the amount of floor covering needed for a room or tile patterns for a floor.
- Language Arts–integrate curriculum by having students write a story, design and illustrate with tile animals, determine and label area of each animal. Write a class story and each student illustrate a portion of the story. Share story with a younger grade level.
- Students can determine area of regular/irregular polygons using coordinate graphing of the polygon vertices and diagonal multiplication.
  1. Place a polygon on coordinate graph and determine ordered pairs of vertices.
  2. List vertex pairs going around the polygon and include starting point at end. Diagonally multiply both sides and total.



	5	1	
4	4	6	30
48	8	6	24
42	7	1	8
5	5	1	7
99			69

  3. Find the difference between the 2 sums and divide by 2.

$$\frac{99-69}{2} = 15 \text{ sq units}$$

Family Connections

- Students will find a polygon shape in the home, trace or plot onto graph paper and determine the area using predetermined square unit or diagonal multiplication.
- Compile a list of uses of area within the home. Share list with the class.
- Send home a set of tangrams for students to share with family.

Additional Resources

Books

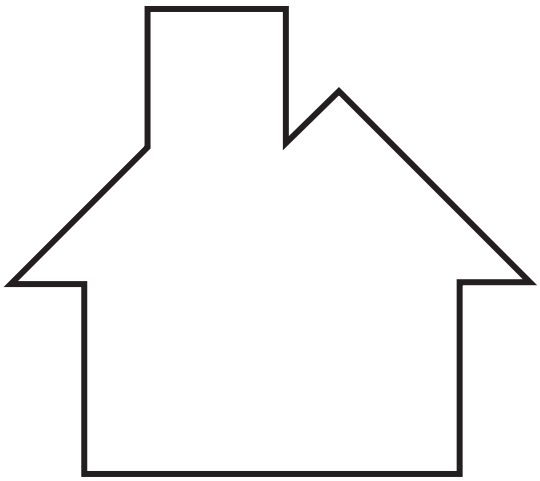
Pezzettino, by Leo Lionni; ISBN 039483156

Tangram Puzzles, by Chris Crawford; ISBN 080697589

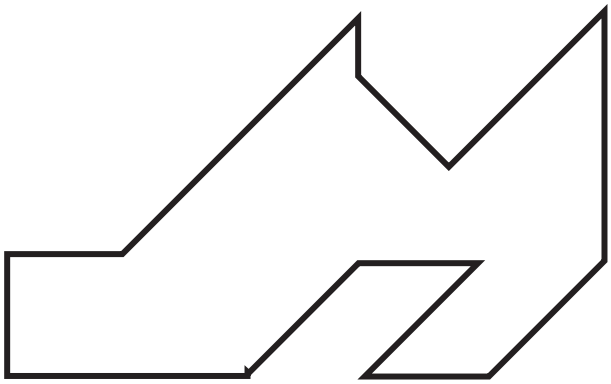
Web sites

http://www.tangrams.ca/

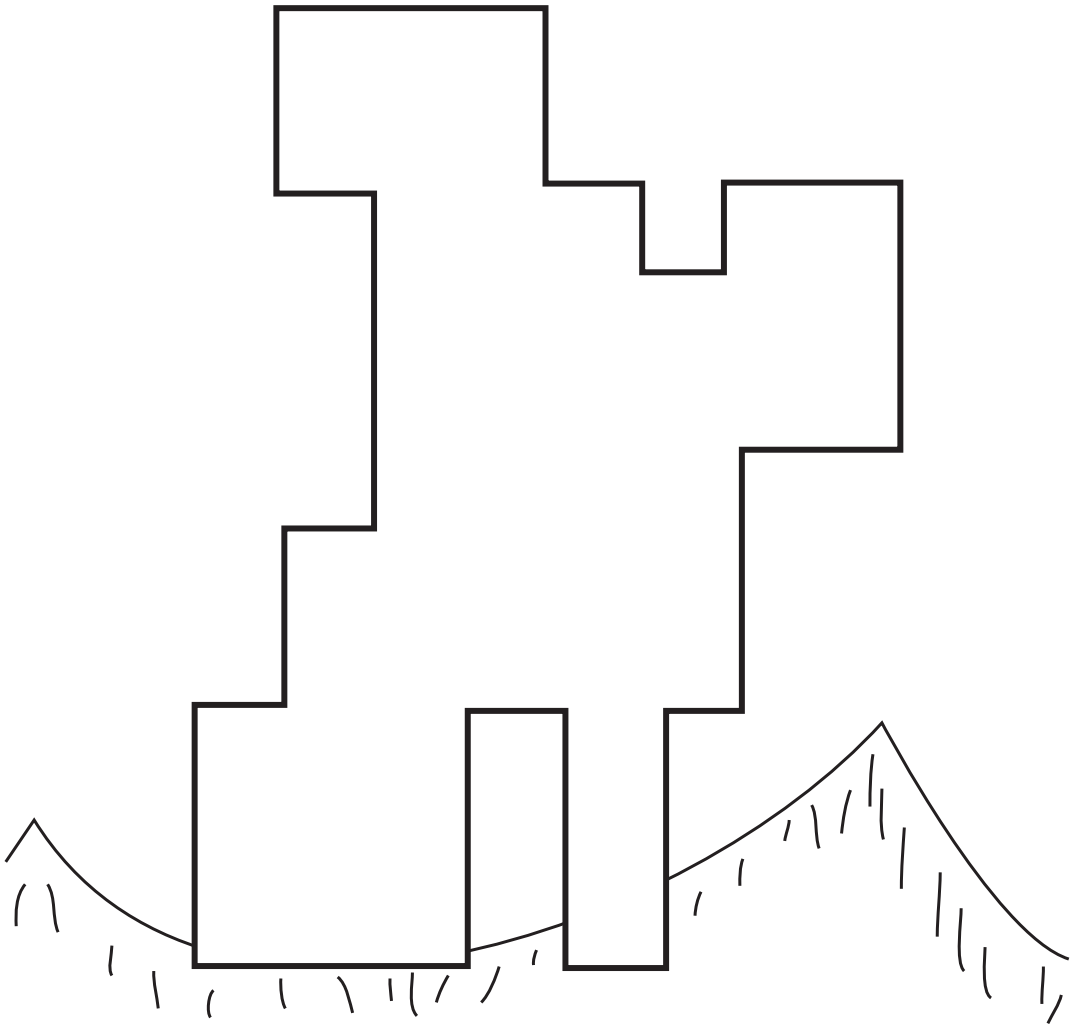
Tangram Puzzle



House



Shoe



One-on-the- Mountain

Fill 'Em Up

Standard IV:

Students will determine area of polygons and surface area and volume of three-dimensional shapes.

Objective 2:

Recognize, describe and determine surface area and volume of three-dimensional shapes.

Intended Learning Outcomes:

2. Become effective problem solvers by selecting appropriate methods, employing a variety of strategies, and exploring alternative approaches to solve problems.
3. Reason logically, using inductive and deductive strategies and justify conclusions.

Content Connections:

Science I-1; All matter has volume
Math III-1; Geometric shapes

Math Standard IV

Objective 2

Connections

Background Information

Volume of a three-dimensional figure is the amount of space inside the figure. While students can be shown and taught the formula to determine a volume measurement, they often need an exploration activity to actually comprehend the more abstract concept. This lesson may serve as an introduction to the concept of volume by providing a hands-on experience to develop an understanding of volume and one way in which it can be measured without the use of a formula.

As students measure the volume of the shapes several relationships should come to light. The volume of the cube is three times the volume of the square pyramid. The volume of a pyramid is 1/3 the volume of a prism with the same base area and height. The volume of a cone is 1/3 the volume of a cylinder with the same base area and height. The sphere is 2/3 the volume of a cylinder.

Using liters to measure the volume transfers to the concept of cubic centimeters since there are 1000 cubic centimeters in a liter and 1000 milliliters in a liter. Students need to become aware that should they overflow the solid or not fill completely, measurements can be inaccurate. If all is done correctly, they should have a close match. After having students measure the volume with milliliters, and providing the formula for area, they can then measure the prism's base and height checking for accuracy.

Research Basis

Ancess, J. (2004). Snapshots of meaning-making classrooms. *Educational Leadership.* 62(1). 36-40.

Teachers have a responsibility to design instruction enabling all students to learn in ways that suit them best. Providing small group activities allows students to share their own and their peers' individual strategies for solving math problems.

Rushton, S., Larkin E. Shaping the learning environment: connecting developmentally appropriate practices to brain research. *Early Childhood Education Journal.* 29(1). 25-33.

Studies reviewed show that pairing brain research with developmentally appropriate practices sets the stage for solid learning. Being aware of both and providing hands-on activities that cater to different learning modalities and stimulate the different regions of the brain makes learning more interesting promoting deeper understanding.

Invitation to Learn

Materials

- ❑ Various containers (size & shape)

Collect and display a variety of shaped containers. Have the students list the containers in order, least to greatest based on their estimate of the volume of each, in their math journal. Ask students to share their ideas, thoughts and methods for determining the container with the greatest volume. Ask students what volume is? What did they look at? Is the height more important than the width or circumference? Where do they see a volume measurement in real life? How do we measure volume? Share with students which containers are larger than others with a quick measurement of the volume of several of the containers.

Instructional Procedures

1. Display a small container of rice, lentils, and water which students might use to measure volume. Question students as to which material would give the best measurement and why?
2. Demonstrate proper measurement, with rice and water, measuring the volume of the small rectangular prism. Compare the measurements and ask which material provides a more accurate measurement. Why?
3. Distribute *How Much Will It Hold?* to each student.

Materials

- ❑ *How Much Will It Hold?*
- ❑ Clear geometric solids
- ❑ Rice
- ❑ Lentils
- ❑ Water
- ❑ Funnels
- ❑ 50ml graduated cylinders
- ❑ Paper towels

4. Working with a partner, students will use the eight geometric solids on their table to estimate which has the least volume and list in order least to greatest.
5. Using a 50ml graduated cylinder and funnel, one student will fill chosen solid and note on chart the volume of the solid. Students will use the same material to measure all of their shapes. Have different pairs use different materials at each table. One pair will use water, one lentils and one group will use rice.
6. Partners will complete measurement a second time to assure accuracy.
7. Repeat the same process with all eight shapes.
8. Students will list solids, greatest volume to least, and compare with estimation.
9. Group students according to the material used to measure volume. Have groups share their findings. Listen as students attempt to explain and question differences in findings.
10. Ask students to compare the relationship between different solids. Do they see any relationships? If students can see a similarity, have them share and discuss their findings. If they cannot see a relationship, aim them toward the cube and square pyramid. Was their measurement of the square pyramid 1/3 of the cube? What are some ways in which they can prove their findings to be true? Can they see any other similarities with other shapes?

Assessment Suggestions

- Performance assessment-completed chart of measurements.
- Journaling-written explanation of relationship of shapes discovered in measuring and how those can be proven. Have students explain possible reasons in differences of volume. Can they suggest ways to increase accuracy?
- Provide another geometric shape for student to measure volume.

Curriculum Extensions/Adaptations/ Integration

- For advanced learners, let them discover the relationship between liters and cubic centimeters using centimeter cubes and water.
- Special needs students can better successfully measure using water from squirt bottles to prevent spilling.
- Science- integrates math to science unit of Matter.

Family Connections

- Students can find a container at home with the volume listed. Compare the volume to another container that is not marked. Is the volume greater? How can they measure the volume? Share with the class their findings.
- Students can answer why a cereal box never seems to be full when opened the first time.

Additional Resources

Books

Math On Call, ISBN 0669457701

How Much Will It Hold??

List least to greatest, which solid has the largest volume.

Estimation

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

Actual after Measurement

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

SHAPE	Volume Measurement 1 # ml	Volume Measurement 2 # ml
Large Square prism		
Small Square prism		
Small rectangular prism		
Square pyramid		
Large Rectangular prism		
Cone		
Large cylinder		
Sphere		

Type of material used for measurement:_____

Look at results for possible relationships between different solids. Write and describe your findings below-

Math III-2, IV-2

Activities

Quadrants/Measure

Getting to the Point

Standard III:

Students will use spatial reasoning to recognize, describe, and analyze geometric shapes and principles.

Objective 2:

Specify locations in a coordinate plane.

Intended Learning Outcomes:

3. Reason logically using inductive and deductive strategies and justify conclusions.
5. Connect mathematical ideas within mathematics, to other disciplines, and to everyday experiences.

Content Connections:

Science IV; fossil formation

Math Standard III

Objective 2

Connections

Background Information

Coordinate graphs are very important since they are the place where algebra and geometry come together.

In the 1600s, Rene Descartes, the French philosopher, mathematician, and scientist, founded analytic geometry and originated the Cartesian coordinates. He is given credit for coming up with the two-axis system we use today. The story goes that he was lying in bed and watching flies crawl over the tiles on the ceiling. He realized that he could describe a fly's position using the intersecting lines of the tiles. The coordinate plane is often called the Cartesian plane after him.

The coordinate plane is divided into four quadrants, which are labeled with Roman numerals. In the fifth-grade math curriculum, the students need to know how to locate and write points defined by ordered pairs of integers in all four quadrants. The center of the coordinate plane is called the origin and has the coordinates of (0, 0). The ordered pairs are referred to as coordinates. We write a point's coordinates inside parentheses, separated by a comma like this: (5, 6). The first number in an ordered pair is called the x-coordinate. The x-coordinate tells us how far from the origin the point is along the x-axis or the horizontal number line. The second number is called the y-coordinate. The y-coordinate tells us how far from the origin the point is along the y-axis or the vertical number line.

Research Basis

Irwin, K.C., (2001). Using everyday knowledge of decimals to enhance understanding. *Journal for research and mathematics education*. 32(4). 399-420.

This study investigated the role of students' everyday knowledge of decimals in supporting the development of their knowledge of decimals. One group worked with problems presented in familiar context, the others were given no contextual connections. The students' ability to make connections between the known and unknown greatly enhanced their understanding of mathematical concepts. Presenting students with real life applications is important when being challenged with new concepts.

Furner, J. M., Yahya, N., and Duffy, M. L., (2005). Teach mathematics: Strategies to reach all students. *Interventions in school and clinic*. 41(1),16-23.

In this article, the authors list 20 different strategies that can help teachers reach all students. These strategies are based on the belief that all students have the right to learn math and feel confident in their ability to do math. It is the responsibility of all teachers to see that mathematics can be learned by every student. The strategies introduced in this article can enable teachers to accomplish this goal.

Invitation to Learn

Materials

- ❑ *The Fly on the Ceiling, a Math Reader*
- ❑ *Graph Paper A*
- ❑ Object that will stick on board

This invitation to learn, allows you to assess the level of students' mastery in locating an object on a coordinate plane using ordered pairs.

- Have a student throw an object that will stick to the board.
- Challenge the students to identify the exact location of the object on the board. Allow time for a short discussion, but try to do as little leading as possible.
- Project transparency of the *Graph Paper A* on board.
- Have a student throw object on to the projected *Graph Paper A*.
- Again challenge the students to identify the specific location of the object.
- If the students suggest numbering the *Graph Paper A,* and using ordered pairs, follow through on their ideas. Let them know that they aren't the first to come up with this idea; Rene Descartes discovered this concept over three hundred years ago. Read the book, *The Fly on the Ceiling, a Math Reader.*
- If they are unable to figure out what to do, proceed directly to reading *The Fly on the Ceiling, a Math Reader* by introducing Rene Descartes, a man who discovered a solution to this problem over three hundred years ago.
- After reading the book, repeat the activity using what they learned from the book.

Instructional Procedures

Getting to the Point

1. Share *The Coordinate Plane* PowerPoint with students introducing them to the coordinate plane with the correct vocabulary. Use the key points to review main ideas.
2. If you're unable to access the PowerPoint, use the *Key Graphing Cling* and introduce the following key points.

Key Points

Plane: a flat surface that goes on forever in every direction

Coordinate plane: made up of an infinite number of points and divided by two number lines

Point of Origin: where the two number lines meet

Axis (plural is "*axes"):*

- *x*-axis: the horizontal line; east of the origin is positive while west is negative.
- *y*-axis: vertical line; north of the origin is positive while south is negative.

Quadrants: the four sections divided by the *x* and *y* axes numbered in order from I-IV starting in the upper right quadrant and going counterclockwise.

Coordinates or ordered pair:

- the two numbers used to locate points on the plane; relative to the point of origin
- always written in parentheses with the *x*-value first *(x,y)*.
- the ordered pair for the point of origin is (0,0).

3. Pass out Dry Erase Mats and using the Key Graphing Cling
   - Give students two different colored strips of paper.
   - Have them make two individual number lines using their mats as a guide with "0" in the center and include both positive and negative numbers.
   - Connect the two strips at "0" using a brad.
   - Rotate the second strip 90 degrees to form the *y-axis* .
   - Overlay these on mats.
   - Begin to label the mats with markers:
     - x- axis
     - y- axis

Materials

- ❑ *The Coordinate Plane*
- ❑ X/Y-axis Dry Erase Mats
- ❑ Key Graphing Cling
- ❑ Marking pens
- ❑ Paper strips
- ❑ Metal brads
- ❑ *Coordinate Cards*

- point of origin
- 4 quadrants (I-IV)

- Using *Coordinate Cards*, have students practice locating and plotting coordinates on their mats.
- Check for accuracy using Key Graphing Cling.
- Working in pairs, students take turns giving and plotting ordered pairs on their Dry Erase Mats.

Points of Interest -Coordinate Activity Stations

These activities are designed for two players each. Pass out *Points of Interest Guidelines* for each team. Have enough materials at each point for at least three to four groups depending on the size of your class. Groups may rotate through each point independently or as directed by teacher. After visiting all *Points of Interest,* have students reflect in journals what they have learned about the coordinate plane and locating points in all four quadrants

Materials

- ❑ *Tic Tac Toe*
- ❑ Pencils
- ❑ Scratch paper
- ❑ *In Search of Buried Treasure*
- ❑ Space Wars
- ❑ Computers
- ❑ Points of Interest Guidelines
- ❑ Coordinate Plane Assessment
- ❑ Math journal

Point 1: "Tic Tac Toe"

1. *Tic Tac Toe* game board.
2. Scratch paper and pencil for each player to record their coordinates.
3. Play rock, paper, and scissors to determine who starts. The winner begins the games, while the other picks X or O symbol.
4. The object of the game is to get four X's or four O's in a row vertically, horizontally, or diagonally.
5. Player one writes down the ordered pairs on scratch paper, then points to that location. It is up to the other player to check for accuracy before a symbol can be placed. If the point is mislabeled, no symbol is made on the game board.
6. Players take turns writing and locating the ordered pairs until one player has four in a row.
7. Students continue playing until they have played a game in all four quadrants.

Point 2: "In Search of Buried Treasure"

1. The object of this game is to practice naming coordinates on a four-quadrant grid.
2. Each player gets one game board, *In Search of Buried Treasure.*
3. Play rock, paper, and scissors to determine who buries the "treasure" first.

4. Player one: Hides the "treasure" in one quadrant by marking it on their coordinate plane (keeps it hidden-a book works well for hiding it).
5. Player two: Guesses the location by writing an ordered pair in the "guess" box on their page while telling Player 1. They then mark it on their coordinate plane.
6. Player one: Marks the same coordinates and then uses the compass to tell Player two in which direction they must go to find the treasure. Caution the students that if Player 1 does not mark their partners point, they may give out the wrong direction.
7. Player two: Writes the direction in their"clue" box.
8. The game continues until the treasure is found.
9. Players switch roles and play again using the second coordinate plane.

Point 3: "Space Wars"

1. Object of the game is to find and destroy each others' hidden spaceships.
2. Players each mark (vertically or horizontally only) their "Fleet" of five ships on their "Air Space" on the coordinate plane. There must be at least one ship in each quadrant.
3. The ships should remain hidden from the opponent's view. A book works well.
4. Taking turns, players call out their "shots" attempting to get "hits" on the opponent's spaceships and destroy them.
5. "Hits" or "misses" should be marked on the other coordinate plane.
6. Use an X for a hit and an O for a miss.
7. A spaceship is destroyed when all points on the craft are hit.
8. A player wins when all five opponent's ships are destroyed.
9. Fleet:

Length	Name
5 points	Death Star
4 points	Warbirds
3 points	Starship
3 points	Fighters
2 points	Starbase

Point 4: Internet Games (optional)

There are many sites on the internet that have interactive games to reinforce the coordinate plane. Here are just a couple.

- Mole Game - http://funbasedlearning.com/algebra/graphing/default.htm

  The students try to catch a mole located within the four quadrants. There are three levels in this game.

  Easy version of Graph Mole - If you are learning how to plot points for the first time, try this fun and easy tutorial and game.

  Medium version of Graph Mole - If you are reviewing how to plot points, play this game.

  Hard version of Graph Mole - Once you have mastered plotting points, try this random question arcade style game.

- Maze game http://www.shodor.org/interactivate/activities/MazeGame/

  This game lets students practice using coordinates by having them move a robot through a mine field to a given target. The students must specify the coordinates of the new location. In order to win, the path must not cross a mine. Challenge the students to place more than five mines. Use the "Help" tab on this site for instructions.

Assessment Suggestions

- In their math journals, have students write what they have learned about the coordinate plane and locating points in all four quadrants.
- *The Coordinate PlaneAssessment* Worksheet

Curriculum Extensions/Adaptations/ Integration

- Art: Have students create simple drawings using coordinates for other students to recreate.
- Place *Points of Interest* -Coordinate Activities in centers for students to continue working with coordinates.

Family Connections

- If students have access to the internet have them play the games found on the internet.
- Play any of the activities from *Points of Interest* with family.

Additional Resources

Books

The Fly on the Ceiling, a Math Reader, by Julie Glass; ISBN 0-679-98607-3

Math Dictionary-The Easy, Simple, Fun Guide to Help Math Phobics Become Math Lovers, by Eula Ewing Monroe; ISBN 978-1-59078-413-6

Mathematicians are People Too, (Vol. 2), by Luretta Rimer; ISBN 0-86651-509-7

Web sites

Background information on the coordinate plane:

http://themathworksheetsite.com/ coordinate plane templates http://www.shodor.org/interactivate/lessons/GraphingCoordinate/

http://mathforum.org/cgraph/cplane/index.html

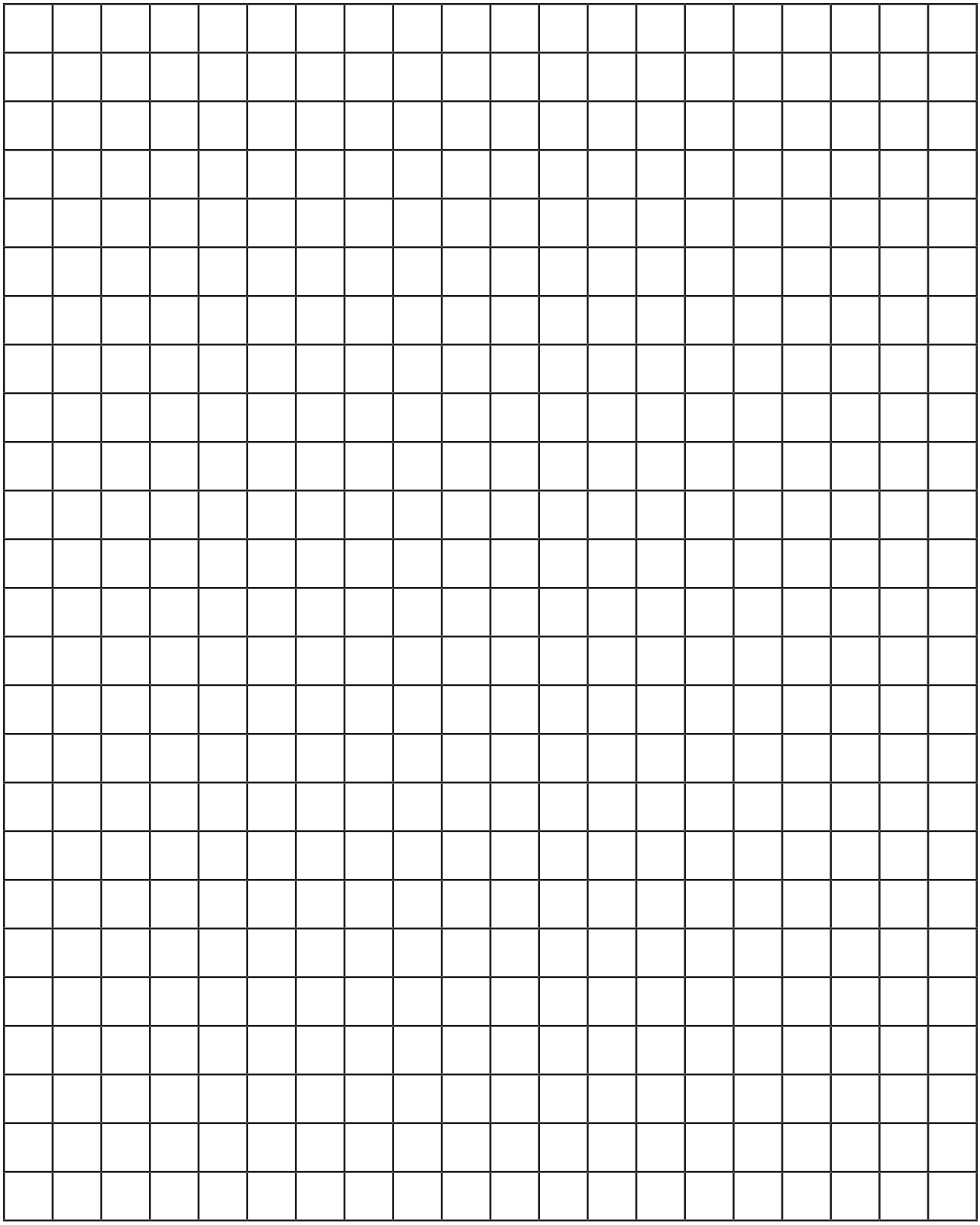
http://www.math.com/school/subject2/lessons/S2U4L1GL.html

http://www.purplemath.com/modules/plane.htm

http://www.learningwave.com/lwonline/algebra_section2/alg_coord.html

http://mathforum.org/cgraph/cplane/index.html

Graph Paper A



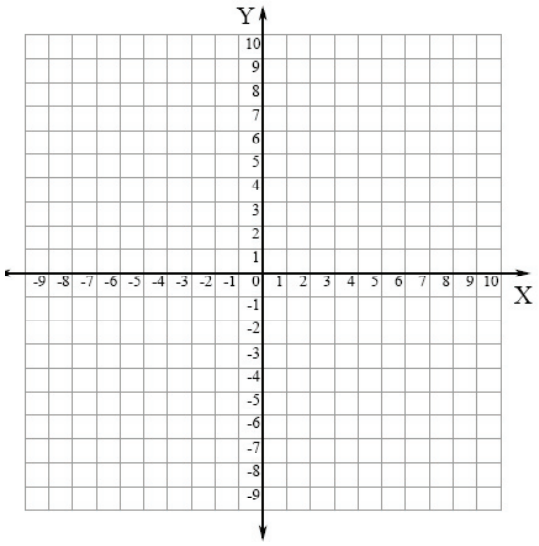
Coordinate Cards

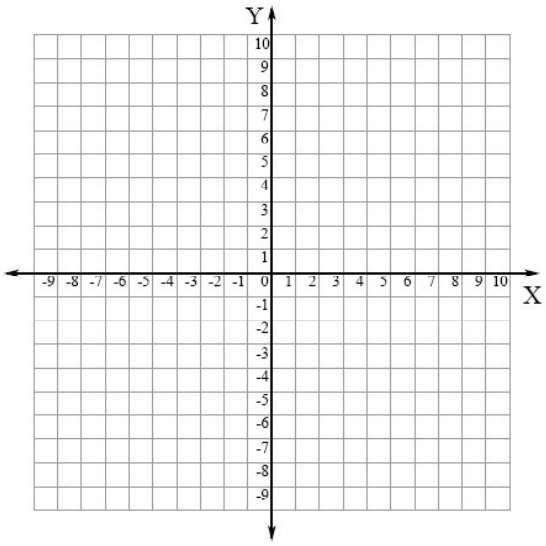
(8,6)	(−10,3)
(−7,−9)	(3,−2)
(4,0)	(−1,5)
(0,−6)	(10,−6)
(9,8)	(−5,8)

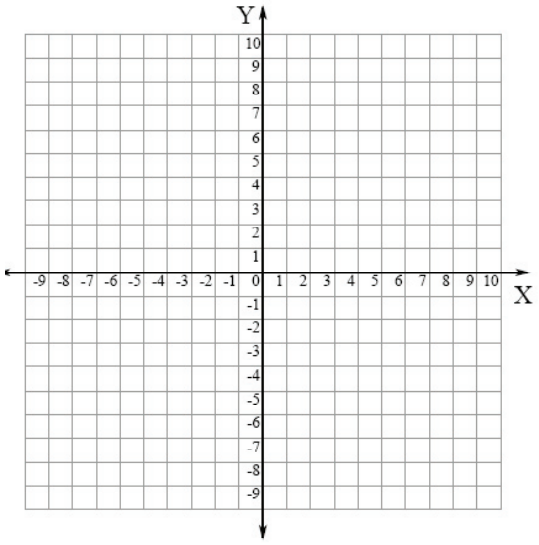
Tic Tac Toe

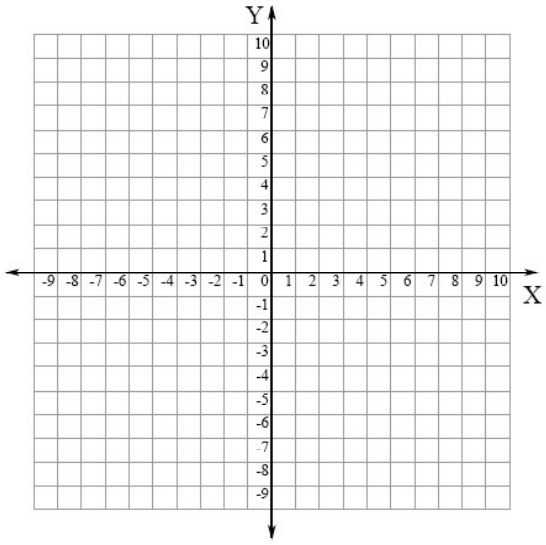
The object of the game is to get four X's or four O's in a row vertically, horizontally, or diagonally.

1. Play rock, paper, and scissors to decide who starts.
2. The winner begins the game, while the other picks X or O.
3. To start, write down the ordered pairs on paper. Point to that location. Other player checks to see if it is correct.
4. If you are right, place your mark. If you are wrong, you lose your turn.
5. Take turns until one player has four in a row.
6. Play four games, one in each quadrant.

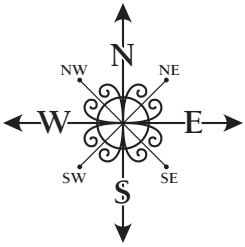


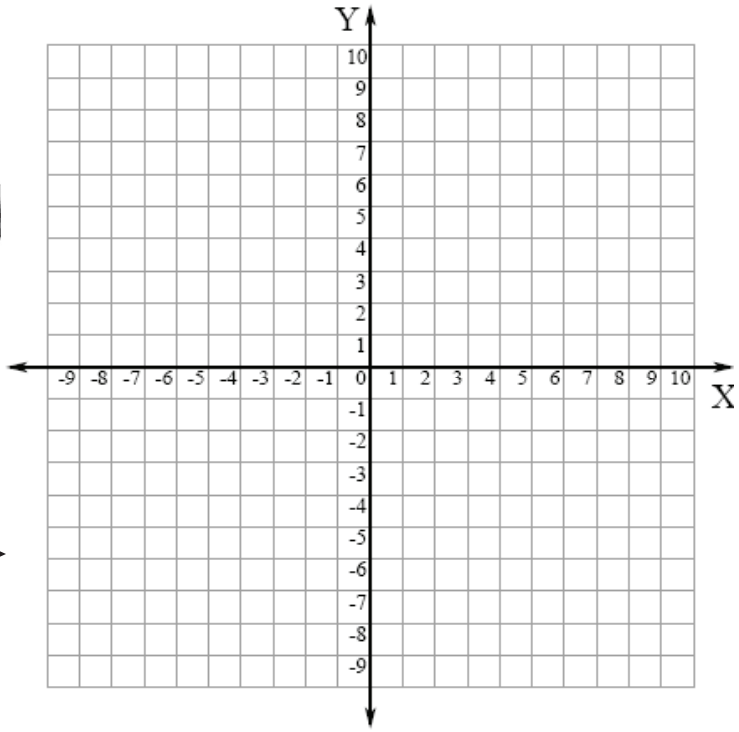






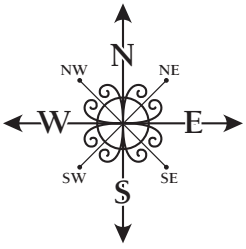
In Search of Buried Treasure

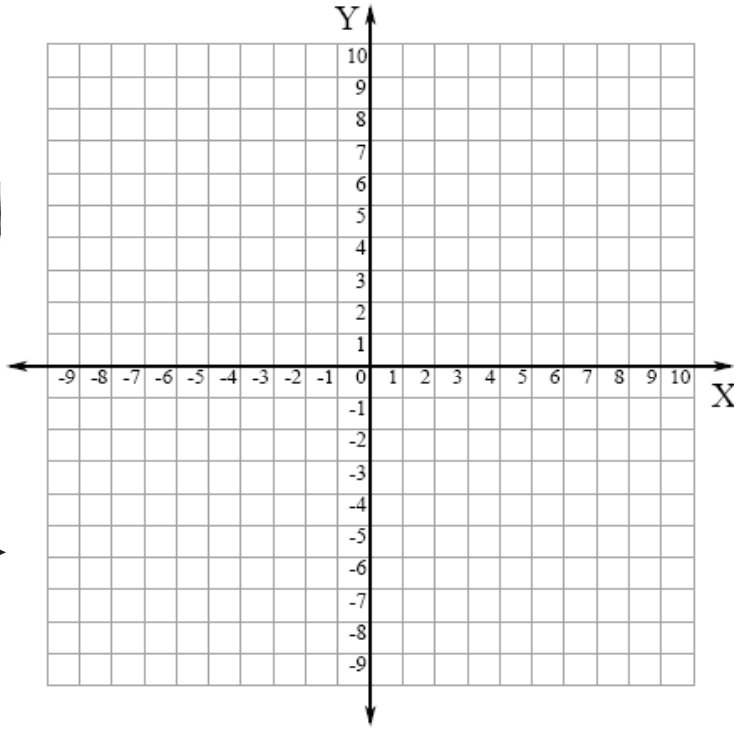




Guess	Clue

In Search of Buried Treasure





Guess	Clue

"In Search of Buried Treasure"

1. The object of this game is to practice naming coordinates on a four-quadrant grid.
2. Each player gets one game board, *In Search of Buried Treasure.*
3. Play rock, paper, and scissors to determine who buries the "treasure" first.
4. Player 1: Hides the "treasure" in one quadrant by marking it on their coordinate plane (keeps it hidden-a book works well for hiding it).
5. Player 2: Guesses the location by writing an ordered pair in the "guess" box on their page while telling player 1. They then mark it on their coordinate plane.
6. Player 1: Marks the same coordinates and then uses the compass to tell player 2 in which direction they must go to find the treasure. Caution the students that if player 1 does not mark their partners point, they may give out the wrong direction.
7. Player 2: Writes the direction in their "clue" box.
8. The game continues until the treasure is found.
9. Players switch roles and play again using the second coordinate plane.

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7. Player 2: Writes the direction in their "clue" box.
8. The game continues until the treasure is found.
9. Players switch roles and play again using the second coordinate plane.

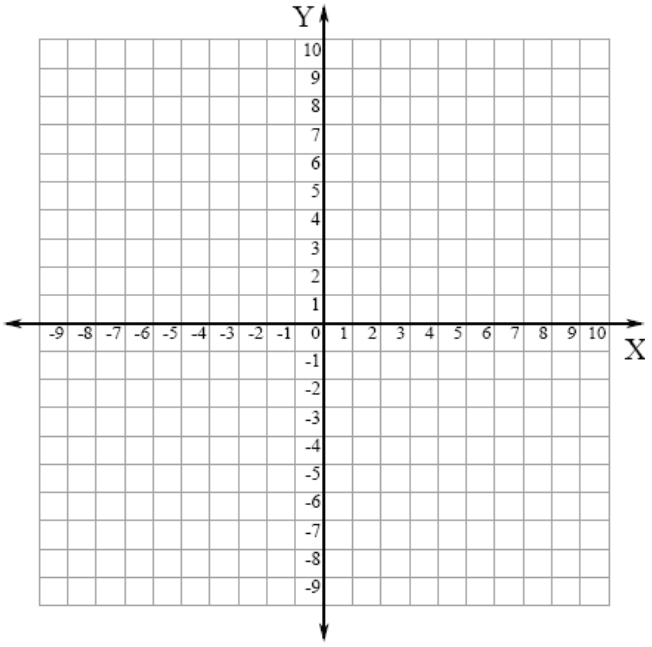
Space Wars

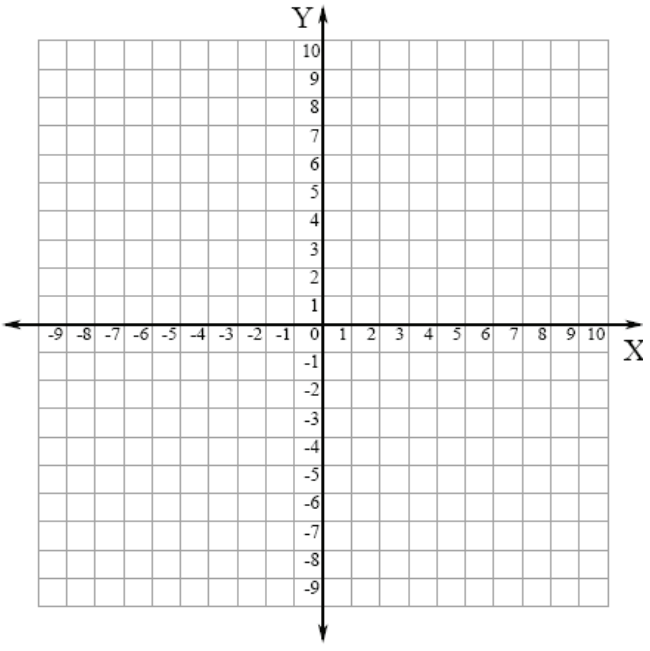
Object: Find and destroy each others' hidden spaceships.
Rules:

1. Players each mark (vertically or horizontally only) their "Fleet" of five ships on their "Air Space" on the coordinate plane. There must be a least one ship in each quadrant.
2. The ships should remain hidden from the opponent's view. A book works well.
3. Taking turns, players call out their "shots" attempting to get "hits" on the opponent's spaceships and destroy them.
4. "Hits" or "misses" should be marked on the other coordinate plane.
5. Use an X for a hit and an O for a miss.
6. A spaceship is destroyed when all points on the craft are hit.
7. A player wins when all 5 opponent's ships are destroyed.

Fleet

Length	Name
5 points	Death Star
4 points	Warbirds
3 points	Starship
3 poin11:37:56 AM	Fighters
2 points	Starbase





Points of Interest Guidelines

Point 1: "Tic Tac Toe"

1. Play rock, paper, and scissors to determine who starts. The winner begins the games, while the other picks X or O symbol.
2. The object of the game is to get four X's or four O's in a row vertically, horizontally, or diagonally.
3. Player 1 writes down the ordered pairs on scratch paper, then points to that location. It is up to the other player to check for accuracy before a symbol can be placed. If the point is mislabeled, no symbol is made on the game board.
4. Players take turns writing and locating the ordered pairs until one player has four in a row.
5. Continue playing until you have played a game in all four quadrants.

Point 2: "In Search of Buried Treasure"

1. Play rock, paper, and scissors to determine who buries the "treasure" first.
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5. Use an X for a hit and an O for a miss.
6. A spaceship is destroyed when all points on the craft are hit.
7. A player wins when all five opponent's ships are destroyed.

Point 4: Internet Games

- *Mole Game* - http://funbasedlearning.com/algebra/graphing/default.htm

  Try to catch the mole located within the four quadrants!!! There are 3 levels in this game. Easy version of Graph Mole - If you are learning how to plot points for the first time, try this fun and easy tutorial and game. Medium version of Graph Mole - If you are reviewing how to plot points, play this game. Hard version of Graph Mole - Once you have mastered plotting points, try this random question arcade style game.

- *Maze Game* - http://www.shodor.org/interactivate/activities/MazeGame/

  Practice using coordinates by moving a robot through a mine field to a given target. You must specify the coordinates of the new location. In order to win, the path must not cross a mine. To make it more difficult place more than 5 mines!!! Use the "Help" tab on this site for further instructions.

The Coordinate Plane Assessment

Write the letter of the point that matches each ordered pair.

_____(0,-5)

_____ (6,5)

_____ (-3,-2)

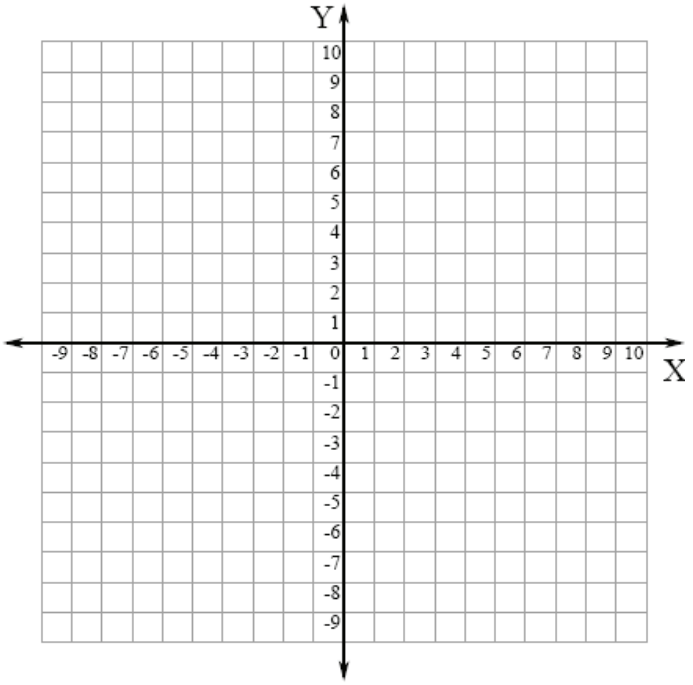
_____ (4,-4)

_____ (-4,-6)

_____ (2,1)

_____ (-5,2)

_____ (-4,3)



Plot each of the following ordered pairs on the coordinate plane.

A (2, 2)

B (3, -2)

C (6, 5)

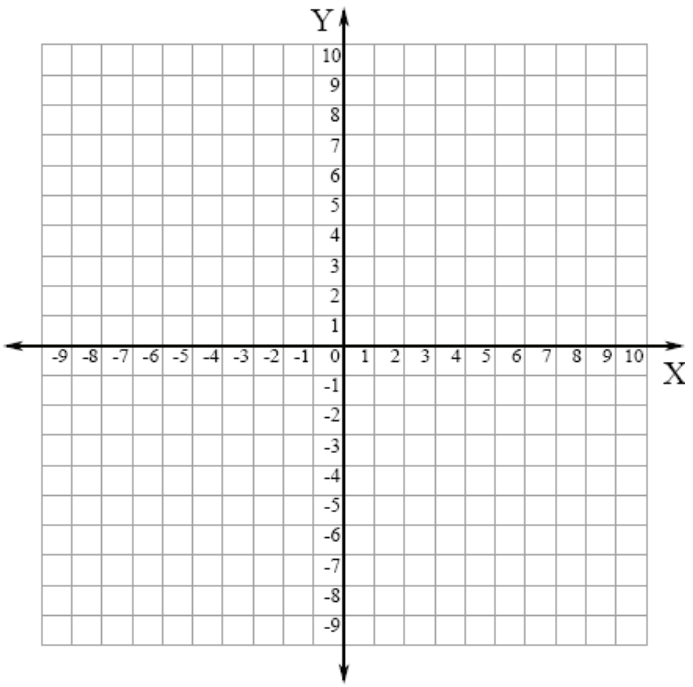
D (-5, -4)

E (-2, -3)

F (-4, 3)

G (0, 3)

H (5, -2)



Insides and Outsides

Math Standard IV

Objective 2

Connections

Standard IV:

Students will understand and apply measurement tools and techniques and determine surface area and volume of three-dimensional shapes.

Objective 2:

Recognize, describe, and determine surface area and volume of three-dimensional shapes.

Intended Learning Outcomes:

3. Reason logically using inductive and deductive strategies and justify conclusions.
5. Connect mathematical ideas within mathematics, to other disciplines, and to everyday experiences.

Content Connections:

Background Information

In order for students to visualize and determine surface area and volume of three-dimensional shapes, it is important to manipulate actual objects. They must also have experience with the concepts of area, nets and rectangular prisms prior to the introduction of this standard and objective (Standard IV Objective 2). When talking about area, we are referring the measurement of a two-dimensional shape. When talking about surface area, we are referring to the measurement of a three-dimensional shape.

The surface area of a prism is the sum of the areas of all the faces, including the bases. The surface area is measured in square units. Although the students may not be familiar with this concept, they have actually experienced it as they've worked with nets. Surface area takes nets one step further by determining actual measurements. The purpose of this lesson is to help the students make this connection. The mathematical formula for surface area is:

$$SA= 2(l \cdot w) +2(l \cdot h) + 2(w \cdot h)$$

The actual formula for surface area involves using length, width and height, at this level. Having the students find the area of each face and then adding them together as square units to find the total will be less confusing for fifth graders.

The volume of a prism tells how many cubic units it takes to fill the prism. Volume is measured in cubic units. The mathematical formula for volume is:

$$V= l \cdot w \cdot h$$

Research Basis

Sowel, E.J. (1989). Effects of manipulative materials in mathematics instruction. *Journal for research in mathematics education,* 20 (4), 498-505.

This review of research sums up the result of sixty studies addressing the effectiveness of manipulatives on student learning and attitudes in mathematics teaching. Sowell concludes that the more concrete the manipulatives, and the longer the time spent using them, the better instructional outcomes.

Hinzman, K.P. (1997). Use of manipulatives in mathematics at the middle school level and their effects on students' grades and attitudes. *ERIC Source* (ERIC # ED411150). Retrieved December 10, 2006, from http://www.eric.ed.gov

This paper reports on a study that examines mathematical scores when hands on manipulatives and group activities were used in the classroom. Results indicate that student performance was enhanced by the use of manipulative materials; and students' attitudes toward mathematics were significantly more positive than those in previous years when manipulatives were not used.

Invitation to Learn

Materials

- ❑ Cubes
- ❑ *Chart Paper*

- Put students into small groups of two to four, and give each group a container with at least 48 cubes.
- Challenge each group to build as many different regular rectangular prisms that have a volume of 12 cubic units.
- Once a prism has been built, ask them to set it aside to keep as an example so that the same prisms are not repeated. (With 12 cubes, they can build four different rectangular prisms: 1x2x6, 1x3x4, 1x1x12, and 2x2x3.)
- Demonstrate the four different prisms that twelve cubes can make by having a few volunteers stand and describe their prisms – length, height, and width. Because of previous lessons on volume, the students should be able to describe their prisms using length, width and height. A discussion on whether a different orientation makes a difference in the dimensions may be needed.
- Review the definition of volume with your students.
- As a class, find the volume for the four different prisms using length, width, and height.

Length	Width	Height	Volume

- On chart paper, record the students findings . Highlight the fact that because each prism is made of twelve cubes, each has a volume of 12 cubic units.

Instructional Procedures

Materials

- ❑ *X/Y-axis Dry Erase Mats*
- ❑ *Key Graphing Cling*
- ❑ Pre-made rectangular prisms
- ❑ Rectangular prism net patterns
- ❑ Markers
- ❑ Cubes
- ❑ *The Great Cover Up*
- ❑ Graph paper

The Great Cover Up

Use the concept of area with 2-D measurement, using a 3-D prism (1 x 2 x 3), to introduce the concept of surface area or 3-D measurement. Ask the students to predict if the prisms have the same volume, do they have the same surface area. Come back to this question at the end of the *Cut it Out!* activity.

- Show the class the pre-made prism or 3-D object and ask the students how they can use area to determine how much wrapping paper would be needed to cover the entire prism without any overlapping.
  - This measurement is called surface area and can only be found for 3-D objects.
- Discuss their ideas for ways to measure the surface area.
- If they struggle coming up with a solution, bring out nets that were used in previous lessons, to visualize the connection between nets and surface area.
- Review area and its formula by finding the area of each face. This discussion is critical in helping students make the connection between area and surface area.

1. With the help of the students, use the *Key Graphing Cling* to model how to draw the net of the pre-made prism.
   - Use the concept of a room to help them visualize each surface as it is being drawn: floor, ceiling, four walls: two front/back walls, two side walls.
   - Use these same terms to label each part of the net.
   - Discuss how to find the area of each face, leading to the idea that adding all areas would give the total area or surface area.

- Discuss how using just letters rather than whole words as labels can be simpler.
- Have students come up with a formula for surface area using only letters:

SA = a + a + b + b + c + c

(f=area of floor and ceiling; b=area of front and back wall; c=area of side walls)

- Plug in actual area for each face underneath formula. Give students *The Great Cover Up* to record data with you.
- Repeat this process of creating nets together using different rectangular prisms.

2. Next, pass out individual *9x11 Double sided X/Y-Axis Dry Erase Mats* and dry erase markers so students can draw more nets with you. Continue to use worksheet to determine and record the surface areas.
3. Now using graph paper and the cubes.
   - Have students work in small groups to reconstruct the original four 12-cube prisms and have them draw nets for each one.
   - Fill out *The Great Cover Up* for each prism.
   - Save their nets for the next activity.

Cut it Out!

1. Use chart made in Invitation to Learn and referring to the first prism listed, have all students find that net and cut it out.
2. Fill out #1 on *Cut it Out* together.
3. Students will repeat the process for the remaining three prisms.
4. Review their predictions of the connection between surface area and volume.
5. In their math journals, have students write what they learned about surface area and volume. Have them analyze the pattern they learned from their *Cut it Out*. Have the students explain how to use a formula to find volume, and how they would find the surface area of a prism.

Materials

- ❑ Graph paper
- ❑ Cubes
- ❑ Scissors
- ❑ Tape
- ❑ *Cut it Out*

Assessment Suggestions

- Informal assessment includes class discussion, math journals and observation of group/partner work.

- *The Great Cover Up*
- *Cut it Out*
- *Birthday Boxes*

Curriculum Extensions/Adaptations/ Integration

- Prism Race
- Challenge students to find out how many different rectangular prisms they can make with a volume of 36 cubes. Encourage them to think of ways to make sure they have made all possible prisms.
- Challenge students to make as many prisms as possible with the same surface area. Have them record the volumes of their solids and note any patterns.
- Art: Draw three-dimensional rectangular prisms on isometric dot paper.
- Design a net that can be folded into a rectangular prism that can hold 24 Multilink cubes.

Family Connections

- Have students find at least five rectangular prisms from household items. Have them measure the length, height, and width of each item. Record the measurements in their math journals, and then find the volume and surface area of each of the items.

Additional Resources

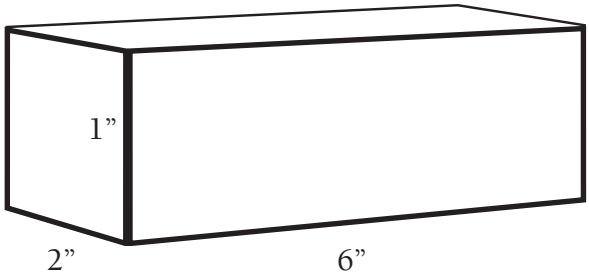
Books

Math Dictionary-The Easy, Simple, Fun Guide to Help Math Phobics Become Math Lovers, by Eula Ewing Monroe; ISBN 978-1-59078-413-6

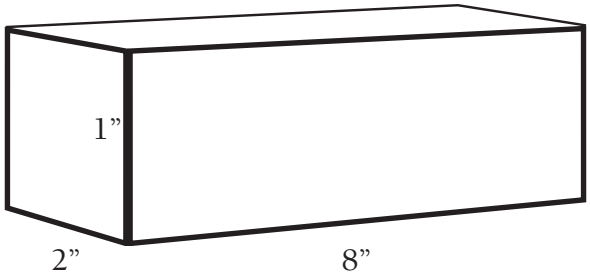
Birthday Boxes

During Jeff's birthday party, all of the tags on his presents were lost. Use the clues to figure out who gave each present. You may use graph paper to draw nets. Show all work.

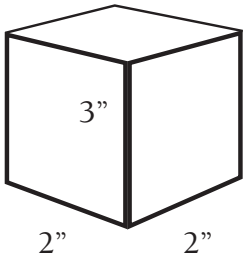
Box A



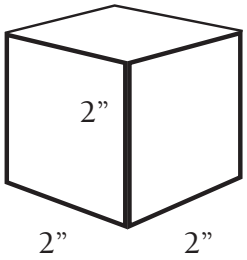
Box B



Box C



Box D



Clues

- The box with Lyla's present has the smallest surface area and the smallest volume.
- Sarah's and Ben's presents have the same volume.
- Ben's present is in the box that has a surface area of 160 square inches.
- The box with Skylar's present has the greatest surface area.

1. Box A was given by _____

2. Box B was given by _____

3. Box C was given by _____

4. Box D was given by _____

Name _____ Date _____

Cut It Out

Dimensions of prism: _____*(l)* x _____*(w)* x _____*(h)*

Volume Net (attach below)

Surface Area

Dimensions of prism: _____ *(l)* x _____ *(w)* x _____ *(h)*

Volume Net (attach below)

Surface Area

Name _____ Date _____

The Great Cover Up

Formula for Area =

Formula for Surface Area =

	length	width	height	Area
floor				
ceiling				
front wall				
back wall				
side wall				
side wall				
Surface Area:				

	length	width	height	Area
floor				
ceiling				
front wall				
back wall				
side wall				
side wall				
Surface Area:				

	length	width	height	Area
floor				
ceiling				
front wall				
back wall				
side wall				
side wall				
Surface Area:				

	length	width	height	Area
floor				
ceiling				
front wall				
back wall				
side wall				
side wall				
Surface Area:				

	length	width	height	Area
floor				
ceiling				
front wall				
back wall				
side wall				
side wall				
Surface Area:				

	length	width	height	Area
floor				
ceiling				
front wall				
back wall				
side wall				
side wall				
Surface Area:				

	length	width	height	Area
floor				
ceiling				
front wall				
back wall				
side wall				
side wall				
Surface Area:				

Prism Race

1. Using cubes, secretly build a prism and record its length, width, height, and volume in the table.
2. At the same time, your and your partner show your prisms.
3. Calculate the volume of your partner's prism and write it down on a piece of paper. Put the slip of paper on the prism. The first player to put the correct volume down wins the round.
4. After each round, calculate the surface area for each of your prisms.
5. The player who wins the most rounds, wins the game.

Length x	Width x	Height =	Volume	Surface Area
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

Math V-2

Activities

Probability

Probability

Standard V:

Students will construct, analyze, and construct reasonable conclusions from data and apply basic concepts of probability.

Objective 2:

Apply basic concepts of probability.

Intended Learning Outcomes:

3. Reason logically, using inductive and deductive strategies and justify conclusions.
4. Communicate mathematical ideas and arguments coherently to peers, teachers, and others using the precise language and notation of mathematics.

Content Connections:

Math I-4; communicate parts of a whole
Math II-1; recongnize, anaylize and use patterns
Language Arts VIII; write to communicate

Math Standard V

Objective 2

Connections

Background Information

Students need to understand the correct terms and vocabulary while discussing probability. It is important for students to learn to distinguish between theoretical and experimental probability. Students can also be introduced to the mathematical formulas.

Theoretical probability:

- The numerical measure of the likelihood that an event will happen or the ratio of the number of ways the event can occur to the total number of possibilities.
- It is the fraction of times we expect an event to occur if the same experiment is repeated over and over.
- It is the represented by the fraction:

  $$\frac{\text{Number of ways the event can occur}}{\text{Total number of possible outcomes}}$$

- Theoretical probability does not change.

Example:

What is the probability of getting a number less than 3 when tossing an ordinary dice? There are six possible outcomes: 1, 2, 3, 4, 5, or 6; all of which are equally likely to occur. Two of these, 1 and 2, are less than 3; so the theoretical probability of getting a number less than 3 is: 2/6 = 1/3.

Experimental probability:

- The numerical measure of what actually happens in an experiment.
- It is the fraction of times an event actually occurs when the same experiment is repeated over and over.
- It is represented by the fraction: $\frac{\text{Number of actual outcomes}}{\text{Total number of possible outcomes}}$
- The experimental probability may vary from the theoretical probability, but the more times the experiment is repeated, the closer the experimental probability approaches the theoretical probability.

Research Basis

Rivero, V. (2006) let technology be your guide. ***American school board journal,*** November, p52-53.

The author gives seven tips for integrating tools of technology to help bolster students' knowledge in math and science education in the classrooms and schools.

Blessman, J., Myszczak, B. (2001). Mathematics vocabulary and its effect on student comprehension. ***ERIC Source*** (ED455112). Retrieved January 12, 2007, from http://www.eric.ed.gov.

In this action research project, interventions were used for improving fifth grade students' comprehension of mathematical vocabulary. The following were used: math journals, student-created math dictionaries, children's literature to introduce and reinforce mathematical concepts, graphic organizers, visual aids, and written explanations of open-ended word problems. These interventions resulted in an increase in comprehension and use of mathematical vocabulary in math performance and in communication of mathematical ideas.

Invitation to Learn

Provide four slips of paper for each student. Ask them to write their name on a paper each time they can answer "yes" to the following questions:

- Do you have black hair?
- Are you an only child in your family?
- Is your birthday in January or July?
- Is there the letter "w" found in your first, middle, or last name?

Materials

- ❑ Paper
- ❑ Container

Have students place the pieces of paper that have their names on them in a container.

Ask students to predict whether they think their name will be chosen. Draw one slip of paper out of the container. Compare students' predictions with the actual results. Tell students that today they will learn how to use mathematics to make better predictions.

Instructional Procedures

Flip the Coin Activity:

Conduct the following activity as a class:

- Trial 1: Hold up a coin and ask the students: "if I flip this coin one time, how many possible outcomes are there?" (2: heads or tails)
- Trial 2: Now ask: If I flip it ten times how many times would you predict that I would get heads? (1/2 of 10 or 5 times.) Pass one coin and paper to record to each student and direct them to flip the coin ten times and record the results. Ask: Did your *outcomes* match your prediction? Collect samplings from several students and record on board or overhead chart, pointing out that there was some variance.
- Trial 3: Have the students predict how many times they will get heads if they flip the coin 30 times. (1/2 of 30 or 15 times) Have them flip the coin 30 times and record the results. Ask: Did your outcomes match your prediction? Again collect samplings from several students and record on board or overhead chart.
- Trial 4: Have the students repeat the experiment, this time flipping the coin 100 times. Again take class samplings and record.

Class discussion:

- Through guided questioning, lead students to an understanding of the difference between what they predicted would occur, Theoretical Probability, and what actually occurred, Experimental Probability, then place words on the board.
- Also discuss the ways they used to record their results. Again through guided questioning, help students to determine the best ways to record results (e.g., tally marks, T-charts, boxes, or columns).

Materials

- ❑ Coins
- ❑ Paper
- ❑ *Theoretical Probability* word card
- ❑ *Experimental Probability* word card

- Be sure to use vocabulary such as: *event, likely, unlikely, possible, impossible, outcomes, theoretical probability, and experimental probability* during discussion.
- Introduce the Theoretical Probability formula:

  $$\frac{\text{Number of ways the event can occur}}{\text{Total number of possible outcomes}}$$

  and the Experimental Probability formula:

  $$\frac{\text{Number of actual outcomes}}{\text{Total number of possible outcomes}}$$
- Lead the discussion to an understanding of the idea that the experimental probability may vary from the theoretical probability, but the more times the experiment is repeated, the closer the experimental probability approaches the theoretical probability. Use the classes total results to illustrate this concept.

Materials

- ❑ *Bag of Colors*
- ❑ Tiles
  - 4 red
  - 3 yellow
  - 2 blue
  - 1 green

Bag of Colors

1. Put students into cooperative learning groups with no more than four to a group
2. Give each group a bag of tiles and a recording sheet for each student
3. With the class, go through the three steps in writing a Theoretical Probability, found at the top of the *Bag of Colors* Recording Sheet.
   - Step 1: Count the number of red tiles.
   - Step 2: Count all of the tiles.
   - Step 3: Write a fraction-Theoretical Probability.
   - Allow each group time to write the Theoretical Probability fraction for the remaining three colors. Do a quick check to make sure they are correct.
4. On their own, each group will fill out the chart and conduct their experiment.

Probability Posters

A collection of various manipulatives to be used in conducting experiments with probability such as:

1. Put students into cooperative learning groups with no more than four to a group.
2. Each group will be given a different set of manipulatives to conduct probability experiments.

3. Each group will then prepare a short visual presentation of their experiment.
4. Give them time to conduct experiments, record results, and prepare presentation.

Materials

- ❑ Colored chips
- ❑ Dice
- ❑ Colored marbles
- ❑ Colored centimeter cubes
- ❑ Small circles or tiles (numbered 1-20)
- ❑ Spinners
- ❑ *Probability Recording Sheet*
- ❑ Poster board / chart paper

Assessment Suggestions

- Completion of *Bag of Colors* and *Probability Recording Sheet*.
- Group presentation of poster or chart displaying results and findings using probability journal.
- Write a journal entry about what they have learned about theoretical and experimental probability.

Curriculum Extensions/Adaptations/ Integration

- Put manipulatives from Probability Station in a center and have students continue conducting probability experiments with materials that they didn't use before. Use *Probability Recording Sheet*.
- In a center, provide manipulatives for students to create new probability experiments and share with the class.

Family Connections

- Share experiments with family.
- Look for ways at home where probability can be used.

Additional Resources

Books

Probability, by Sarah Jane Brian; ISBN 0590373676

Web sites

http://www.brainpop.com/

http://www.rainforestmaths.com/

http://argyll.epsb.ca/jreed/math7/strand4/4201.htm (Theoretical/Experimental Probability Web lesson with activities)

http://www.amathsdictionaryforkids.com

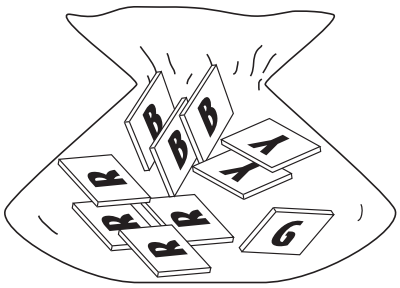
http://www.shodor.org/interactivate/lessons/PlayWithProbability/ a site where students can learn how to calculate both theoretical and experimental probability by rotating through a series of work stations.

Word Cards

Theoretical Probability	**Experimental Probability**

Bag of Colors Recording Sheet

R=red
B=blue
Y=yellow
G=green



Step 1: Count the number of red tiles.
Step 2: Count all the tiles.
Step 3: Write a fraction.

$$\frac{\text{Number of red tiles}}{\text{Total number of tiles}} = \_\_\_\_\_$$

The Theoretical probability of picking a red tile is $\frac{4}{10}$

Use the following steps to complete the table:

Step 1: Decide how many times you are going to conduct the experiment.
Step 2: Write down the number and color of each tile.
Step 3: Write the Theoretical Probability fraction for each color.
Step 4: Pull out one tile at a time, tally the result; remember to replace the tile in the bag.
Step 5: After conducting the experiment, write the fractions for the actual outcomes.

Step 1: Total number of events:_____	Theoretical Probability	Experimental Probability	
Step 2: Objects	Step 3: Write the Fraction	Step 4: Tallies	Step 5: Write the Fraction

How did the Theoretical Probability compare to the Experimental Probability?

_____

_____

THINK ABOUT IT: What could you do to bring the Experimental Probability results closer to the Theoretical Probability results?

_____

_____

Probability Recording Sheet

Remember the following steps to conduct your own experiment as you complete the table:

Step 1: Decide how many times you are going to conduct the experiment.
Step 2: Write down the number and color of each tile.
Step 3: Write the Theoretical Probability fraction for each color.
Step 4: Pull out one tile at a time, tally the result; remember to replace the tile in the bag.
Step 5: After conducting the experiment, write the fractions for the actual outcomes.

Step 1: Total number of events:_____	Theoretical Probability	Experimental Probability	
Step 2: Objects	Step 3: Write the Fraction	Step 4: Tallies	Step 5: Write the Fraction

How did the Theoretical Probability compare to the Experimental Probability?

_____

_____

THINK ABOUT IT: What could you do to bring the Experimental Probability results closer to the Theoretical Probability results?

_____

_____

Probability

Standard V:

Students will construct, analyze, and construct reasonable conclusions from data and apply basic concepts of probability.

Objective 2:

Apply basic concepts of probability.

Intended Learning Outcomes:

2. Become effective problem solvers by selecting appropriate methods, employing a variety of strategies, and exploring alternative approaches to solve problems.
5. Connect mathematical ideas within mathematics, to other disciplines, and to everyday experiences.

Content Connections:

Math I-4; communicate parts of a whole.
Math II-1; recognize, analyze, and use patterns.

Math Standard V

Objective 2

Connections

Background Information

It is important for students to make connections between probability and real life applications. Through the use of games, the students can learn to make better predictions, increasing their probability to win. The terms: likely, unlikely, certain, possible, and impossible become more meaningful because of the variance of outcomes. The students need to have a prior understanding of the terms theoretical and experimental probability. Probability is not just a guess; it is based on mathematical formulas.

Research Basis

Moch, P.L (2001). Manipulatives Work!. *The Educational Forum*. 66, 81-87.

Under current reforms of mathematical curriculum much debate has arisen over the issues of depth being more important than breadth; and the pressures of how inclusion affects standardized testing results. The author discusses the use of manipulatives and how it strengthens current mathematical curriculum and reinforces the notion that worksheets should not be the beginning or the end of any student's mathematical experience. She notes, however, that is important that teachers gain proficiency in appropriate usage to gain maximum benefits.

Koirala, H.P. (2002). Facilitating Student Learning Through Math Journals. *ERIC Source* (ED476099). Retrieved January 12, 2007, from http://www.eric.ed.gov.

The author, in analyzing over 1800 math journal entries over a period of five years, has determined that journal writing has a great potential in aiding student mathematical learning. Math journals

help students demonstrate their mathematical thinking processes and understanding, and aid teachers in better understanding students' grasp of the concepts.

Invitation to Learn

Tell student that you are going to play a short game of "Even I Win, Odd You Lose." When they argue that that isn't fair then concede that you made a mistake and rename the game "Even I Win, Odd You Win." Then tell them that they're going to use the four basic operations on a number and if the final answer is "even", you win; if it is "odd," they win.

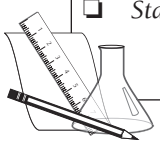
1. Have students pick a number
2. Add *3 to it *(*this number can be even or odd)*
3. Multiply the sum by *6 *(*must always be an even number)*
4. Subtract *6 from the product *(*must always be the same number that is used in step 3)*
5. Divide by *2 *(*don't change this number)*
6. Ask "What is the quotient?"
7. Ask "Even or Odd?" State: "I win!!!" *(*You will always win. If any student comes up with an odd number, challenge their answer by walking through each step and checking their answers. You can change the numbers, but note the above teacher notes.)*

After several rounds, or when the students begin to realize that they will never win, begin discussion of why odd numbers will never win.

As a final note, you might point out that you really didn't make a mistake with the original title of the game, "Even I Win, Odd You Lose."

Materials

- ❑ *Escape From the Core*
- ❑ Markers
- ❑ Dice
- ❑ Direction card
- ❑ *Zip, Zap, Zonk, You Win*
- ❑ Pencils
- ❑ Scratch paper
- ❑ *Ya' Don't Know Beans*
- ❑ Beans
- ❑ *Do You Feel Lucky?*
- ❑ Bags to hold counters
- ❑ 20 counters or tiles
- ❑ *Math Journal*
- ❑ *Station Rules*



Instructional Procedures

"Playing Around With Probability" Stations

These games are designed for two to three players each. Have enough materials at each station for at least three to four groups depending on the size of your class. Groups may rotate through each station independently or as directed by teacher. Remind the students to respond to the questions in their math journal at the end of each activity before advancing to the next station.

Station 1: "Escape from the Core"

1. All players place their markers in the center box.
2. The goal of the game is to be the first player to move a marker off the board.
3. On each turn, a player determines which way they want to rotate the *Direction Card*. This and the number rolled on the die will determine the direction moved for that turn.
4. Roll the die and move in the direction indicated by the number on the *Direction Card*. Each player only moves one square (regardless of the number on the die).
5. Continue playing until the first player moves off the board.
6. The winning player scores one point for each victory.
7. Play until time is over.
8. Respond in *Math Journal*

Station 2: "Zip, Zap, Zonk, You Win!"

1. Each player gets a game board.
2. First player, The Zap Master, thinks of a 2-digit number, writes it on scratch paper, and keeps it hidden from other player.
3. The second player, The Guesser, writes their guess on line #1 of the game board.
4. The Zap Master puts an x in the correct clue column on line #1.
   Clue guidelines:
   - Zip = The Guesser has nothing correct
   - Zap = The Guesser has correct digit(s), but in the wrong position
   - Zonk = The Guesser has one correct digit in the correct position
   - You Win = The Guesser has guessed the correct number
5. The Guesser continues guessing numbers until the correct number is guessed.
6. Players then switch roles and continue playing.
7. Respond in *Math Journal*

Station 3: "Ya' Don't Know Beans"

1. This game is for two players. *(*Teacher note: After first round, can be played with up to five players.)*

2. Each group will get a game board, "*Ya' Don't Know Beans,*" 21 beans, pair of dice, and a pencil.
3. Each player rolls one die to determine who goes first high number writes first.
4. Players take turns writing their initials in one box on the bottom until an *equal* number of boxes have been filled in. Depending on number of players, there will be empty boxes.
5. Players take turns rolling the dice, adding the sums, and placing a bean in that column until all 21 beans have been placed.
6. Each player then totals the number of beans placed in each of the columns with their initials. Player with the most beans wins.
7. Respond in *Math Journal*.

Station 4: "Do You Feel Lucky?"

1. Each group gets a game board and a bag with 20 counters (10 of each color). They determine which color moves two spaces and which moves three spaces by writing in the blanks.
2. They then decide which player will go first.
3. Before drawing out a counter, the player first predicts which color they will draw.

   Movement guidelines:

   - An incorrect guess……...move one space.
   - A correct guess (_Players write in which color_)…….move two spaces.
   - A correct guess (_Players write in which color_)…….move three spaces
4. Do not return counters to the bag after drawing.
5. First player to reach the center wins!
6. Respond in *Math Journal*.

Math Journal Response Questions

Station 1: "Escape from the Core"

- Before beginning the game, predict how many turns it will take to win the game. _____. How close was your prediction? _____ ___
- How did knowing about probability affect your decisions on rotating the direction card?
- How often did your experimental probability match the theoretical probability?

- How could you change the rules to increase your probability of winning?

Station 2*:* "Zip, Zap, Zonk, You Win!"

- Before beginning the game as The Guesser, predict how many turns it will take to guess the number? _____ How close was your prediction? _____
- Before beginning the game as Zap Master, predict how many turns it will take your partner to guess the number? _____ How close was your prediction? _____
- As The Guesser, what strategies did you use to select your numbers?
- As the Zap Master, what strategies did you use to pick your number?
- How does knowing about probability increase your chances of winning?
- How could you change the rules to make it more challenging?

Station 3: "Ya' Don't Know Beans"

- What strategies did you use in choosing which boxes to initial?
- After you and your partner have placed your initials in the boxes, predict how many beans you will win._____ How close was your prediction? _____
- On the next round, did you change your strategies in choosing where to place your initials? Why or why not?
- How does knowing about probability increase your chances of winning?

Station 4: "Do You Feel Lucky?"

- What strategies did you use in guessing which color you would draw?
- Did the different values of the colors influence your guess? Why or why not?
- How does knowing about probability increase your chances of winning?
- How would the game change if you returned the tiles after each draw?

Assessment Suggestions

- *Math Journal*

Curriculum Extensions/Adaptations/ Integration

- Using the activity *"Dice Sums"* from the 2003 Elementary CORE Academy in connection with Station 3: Ya' Don't Know Beans, may help students better apply probability in their selections.
- These activities can be put in a math center and allow students to continue to playing these games.
- Have students investigate how changing the rules to any of these game changes the probability of winning.

Family Connections

- Play a game that uses probability with the family.
- Allow students to take home the station games to play with their families.
- The book, *Family Math*, has a variety of probability games that could be used as a grade-level or school wide Family Math Night.

Additional Resources

Books

Family Math, by Ruth Cossey, Jean Kerr Stenmark, and Virginia Thompson; ISBN 0912511060

Probability, by Sarah Jane Brian; ISBN 0590373676

CDs

Mrs. Glosser's The Math Goodies CD contains over 275 pages of self-paced instruction to make math fun! This can be purchased online at the following website: http://www.mathgoodies.com/cd/

Web sites

http://www.shodor.org/interactivate/activities/CrazyChoicesGame/ - *Crazy Choices Game*-an interactive site where students can use different random number-generating devices

http://www.shodor.org/interactivate/lessons/Probability/ - *Race Cars* - an interactive site where students learn about probability by predicting the outcome of planned experiments and playing racing games.

http://www.shodor.org/interactivate/lessons/PlayingWithFire/ - *Playing with Fire*-Students use probability to set a simulated forest on fire.

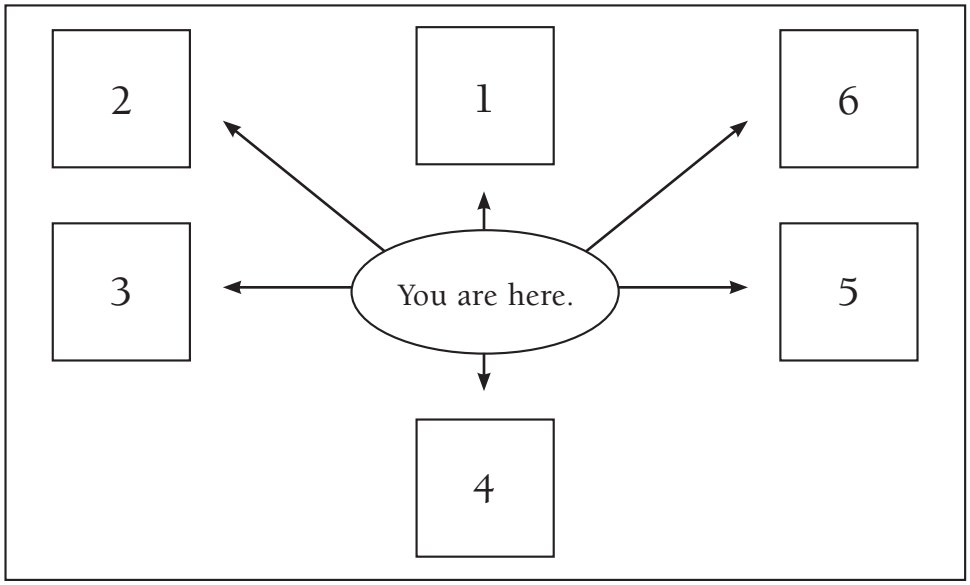
http://illuminations.nctm.org/LessonDetail.aspx?id=L585 - *Sticks and Stones*-Students can investigate probability with a Native American game

http://www.mathgoodies.com/lessons/vol6/complement.html - *Complement of an Event*-a series of five probability experiments using different manipulatives.

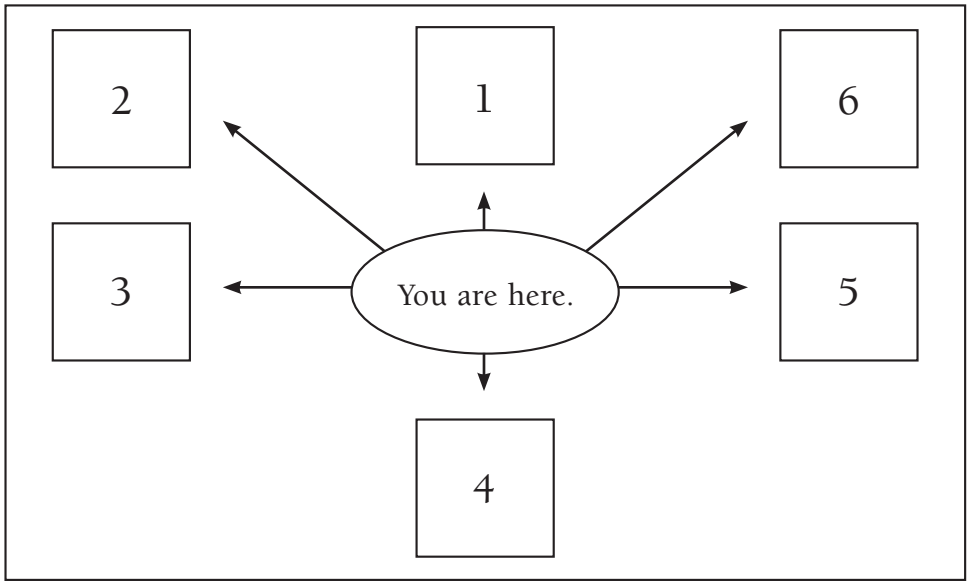
Escape from the Core

				Core (start)				

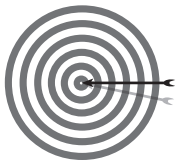
Direction Card



Direction Card



Zip, Zap, Zonk, You Win



	Guess	Zip Nothing correct	Zap Correct digit, Wrong position		Zonk Correct digit, Correct position	You Win!
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Ya' Don't Know Beans

Initials or markers for each player	Sum of dice	2	3	4	5	6	7	8	9	10	11	12

Do You Feel Lucky?

An incorrect guess....move 1 space
A correct guess (_____)....move 2 spaces
A correct guess (_____)....move 3 spaces

	Start Player 1					Sorry, lose a turn			
				Take 1 more turn			Go back 1 space		
Go ahead 1 space									
								Go back 1 space	
Go back 1 space									
									Go ahead 1 space
	Go back 1 space			Take 1 more turn					
Sorry, lose a turn					**Start** Player 2				

Do You Feel Lucky?

Finish

Math Probability Journal

Name: _____

"Do You Feel Lucky?"

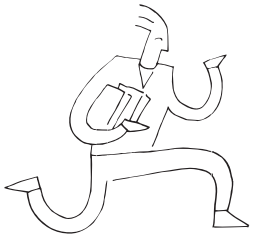
1. What strategies did you use in guessing which color you would draw?

2. Did the different values of the colors influence your guess? Why or why not?

3. How does knowing about probability increase your chances of winning?

4. How would the game change if you returned the tiles after each draw?

Escape from the Core



1. Before beginning the game, predict how many turns it will take to win the game _____.

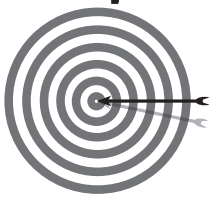
2. How close was your prediction? _____

3. How did knowing about probability affect your decisions on rotating the direction card?

4. How often did your experimental probability match the theoretical probability?

5. How could you change the rules to increase your probability of winning?

Zip, Zap, Zonk, You Win!



1. Before beginning the game as "The Guesser," predict how many turns it will take to guess the number? _____ How close was your prediction? _____

2. Before beginning the game as "Zap Master," predict how many turns it will take your partner to guess the number? _____ How close was your prediction? _____

3. As "The Guesser" what strategies did you use to select your numbers?

_____

_____

4. As the "Zap Master" what strategies did you use to pick your number?

_____

_____

5. How does knowing about probability increase your chances of winning?

_____

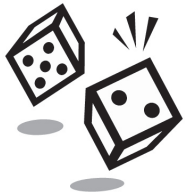
_____

6. How could you change the rules to make it more challenging?

_____

_____

Ya' Don't Know Beans



1. What strategies did you use in choosing which boxes to initial?

_____

_____

2. After you and your partner have placed your initials in the boxes, predict how many beans you will win._____ How close was your prediction? _____

3. On the next round, did you change your strategies in choosing where to place your initials? _____ Why or why not?

_____

_____

4. How does knowing about probability increase your chances of winning?

_____

_____

Station Rules

Station 1 Rules: "Escape from the Core"

1. All players place their markers in the center box.
2. The goal of the game is to be the first player to move their marker off the board.
3. On each turn, a player determines which way they want to rotate the Direction Card. This and the number rolled on the die will determine the direction moved for that turn.
4. Roll the die, and move in the direction indicated by the number on the Direction Card. Each player only moves 1 square (regardless of the number on the die).
5. Continue playing until the first player moves off the board.
6. The winning player scores 1 point for each victory.
7. Play again if there is time.
8. Respond in Math Journal.

Station 2 Rules: "Zip, Zap, Zonk, You Win!"

1. Each player gets a game board.
2. First player, "The Zap Master," thinks of a 2-digit number, writes it on scratch paper, and keeps it hidden from the other player.
3. The second player, "The Guesser", writes their guess on line # 1 of the game board.
4. "The Zap Master" puts an x in the correct clue column on line # 1. Clue guidelines:
   - Zip = "The Guesser" has nothing correct.
   - Zap = "The Guesser" has correct digit(s), but in the wrong position.
   - Zonk = "The Guesser" has one correct digit in the correct position.
   - You Win = "The Guesser" has guessed the correct number
5. "The Guesser" continues guessing numbers until the correct number is guessed.
6. Players then switch roles and continue playing.
7. Respond in Math Journal.

Station 3 Rules: "Ya' Don't Know Beans"

1. This game is for 2 players
2. Get a game board, "Ya' Don't Know Beans", 21 beans, pair of dice, and a pencil.
3. Each player rolls one die to determine who goes first (High number writes first)
4. Players take turns writing their initials in one box on the bottom until an <u>equal</u> number of boxes have been filled in.
5. Take turns rolling the dice, adding the sums, and placing a bean in that column until all 21 beans have been placed.
6. Each player then totals the number of beans placed in each of the columns with their initials. Player with the most beans wins.
7. Respond in Math Journal.

Station 4 Rules: "Do You Feel Lucky?"

1. Get a game board and a bag with 20 counters (10 of each color). Determine which color moves 2 spaces and which moves 3 spaces by writing in the blanks.
2. Decide which player will go first
3. Before drawing out a counter, predict which color you will draw. Movement guidelines:
   - An incorrect guess……..move one space
   - A correct guess (_color_)…….move two spaces
   - A correct guess (_color_)…….move three spaces
4. <u>Do not</u> return counters to the bag after drawing
5. First player to reach the center wins!
6. Respond in Math Journal.

Appendix

Name _____ Date _____

Playing with Remainders

Listen to the play *"Round-up!"* and then answer the following four questions:

1. 23 people went to the family reunion. If 5 people could fit in each car, how many cars were needed to take people to the *No-Remainder Ranch*?

2. At the *No-Remainder Ranch* 4 people were assigned to each cabin. How many cabins were needed for the 23 people?

3. While they were at the ranch, the family members went on a river-rafting trip. If 6 people could fit on each raft, how many rafts were needed for the 23 people?

4. Why did Tyler and Nikki have to round up their remainders each time in this story?

Listen to the play *"You Just Drop It!"* and then answer the following four questions:

1. How many bunches of 7 flowers could Shailee and Marisol make with 37 flowers?

2. How many plates of 6 brownies each could be made with 34 brownies?

3. How many plates of 8 cookies each could be made with 50 cookies?

4. Why did Shailee and Marisol have to drop their remainders each time in this story?

Listen to the play "*Sharing is Very Important?* and then answer the following three questions:

1. Scott and Travis cut an 11-foot rope into two equal pieces. How long was each piece?

2. Four boys are sharing 17 Airheads equally. How many Airheads does each boy get to eat?

3. Why didn't the remainders in this story need to be rounded up or dropped?

Write a good rule for what to do with remainders.

when you need to round up the remainder	when you need to drop the remainder	when you need to share the remainder equally

Name _____ Date _____

Remainder Stories

Answer each question with a complete sentence. Then tell how you used the remainder (whether you rounded up, dropped, or shared the remainder equally). Last, tell why you used the remainder the way you did. Each problem is worth four points (1 point = correct answer; 1 point = complete sentence; 1 point = correct use of remainder; 1 point = explanation for use of remainder).

1. Skyler is helping his mother plan a wedding breakfast for his older sister, Jessica. They are expecting 63 family members to attend, and they are using round tables that seat 8 guests each. How many tables will be needed to seat 63 people?

2. Skyler and his sister, Rylie, are preparing flower bouquets as centerpieces for each table at the wedding breakfast. They hope to have enough to decorate the table that is displaying the wedding cake as well. They have 67 carnations and wish to put 6 carnations in each bouquet. How many bouquets can they make with 67 carnations?

3. Rylie is going to the zoo for her 12th birthday party, and she is taking 9 friends. The zoo has a new baby giraffe, and groups of 3 children are allowed at a time in a special viewing room to see the giraffe and his mother. How many tours will it take for Rylie and her 8 friends to see the giraffe?

4. At Rylie's 12th birthday party, she wants to give each of her friends a jar with a variety of candy from the candy store. She has 5 friends coming, and she has 113 individually wrapped pieces of candy. If she gives each person the same number of pieces of candy, how many pieces will each friend receive in her candy jar?

5. While Rylie is celebrating with her friends, Skyler's mom gave him $10.00 to share equally with his three best friends so they could buy candy too. How much money do Skyler and his friends each get to spend?

6. Jessica is making curtains for her new apartment. She has 15 yards of material to make 2 sets of curtains. How much fabric can she use for each set?

7. Jessica's mother is serving punch at the wedding reception. She has a punch bowl that holds 106 ounces of punch. How many 8-ounce servings can be poured from the punch bowl when it is full?

Name _____ Date _____

Divisibility Test

1. Write the 24 numbers you created in the first column.
2. Decide if your numbers are divisible by 2, 3, 5, 6, 9, or 10. Write yes or no in the correct colums.

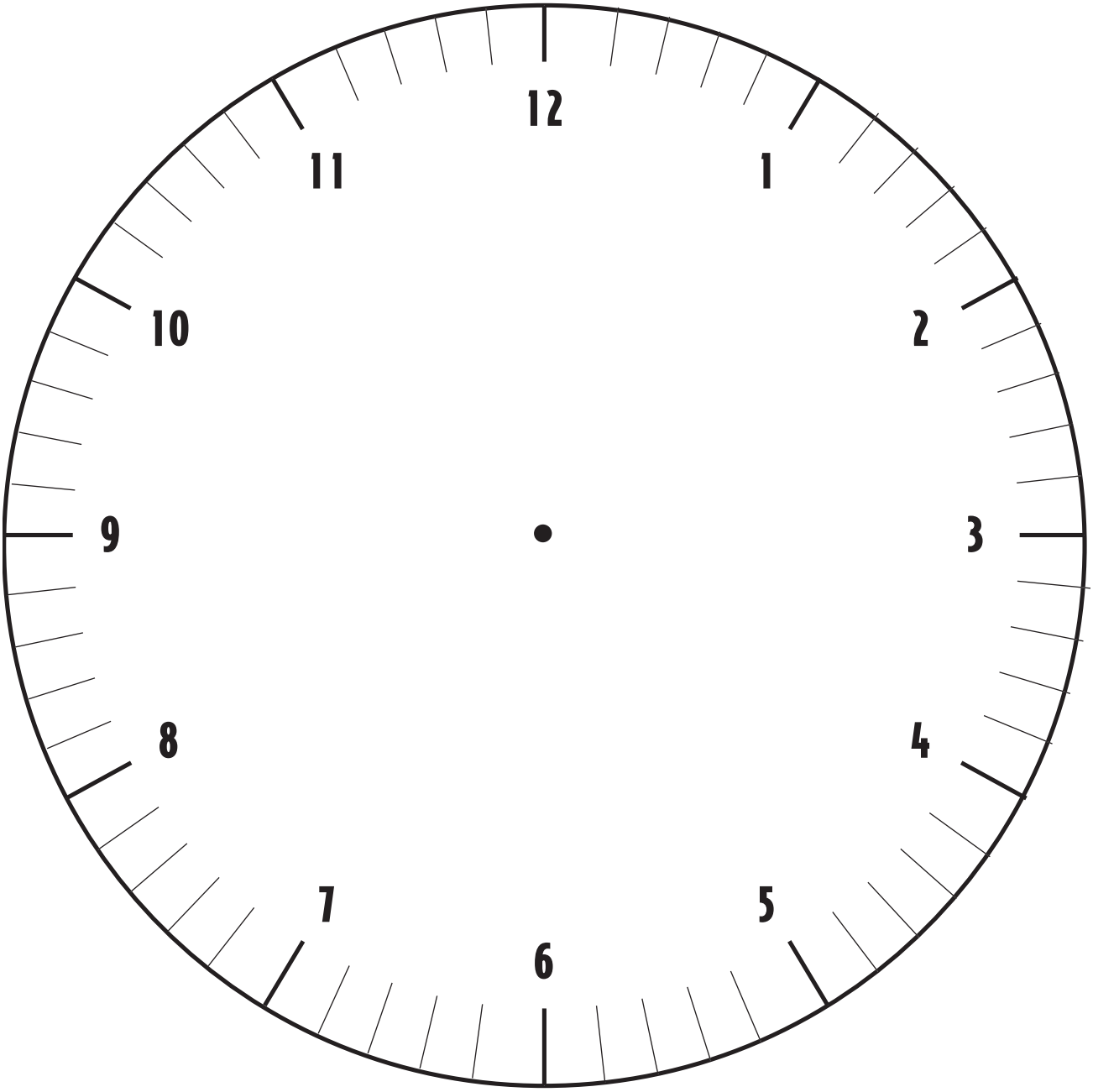
Number	2	3	5	6	9	10
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						
21.						
22.						
23.						
24.						

Name _____ Date _____

Divisibility Rules

Number Divisible By	My Hypothesis	The Actual Rule
2		
3		
5		
6		
9		
10		

Clock



Cake

Can You Make?

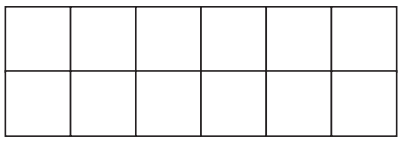
Can You Make?	with wholes	with halves	with thirds	with fourths	with fifths	with sixths
1						
1/2						
1/3						
1/4						
1/5						
1/6						
1/7						
1/8						
1/9						
1/10						
1/11						
1/12						

Can You Make?

Can You Make?	with sevenths	with eighths	with ninths	with tenths	with elevenths	with twelfths
1						
1/2						
1/3						
1/4						
1/5						
1/6						
1/7						
1/8						
1/9						
1/10						
1/11						
1/12						

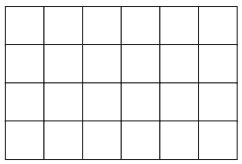
Share Equally

Share each of the items below as directed. Be prepared to explain how you did the sharing.



3

4



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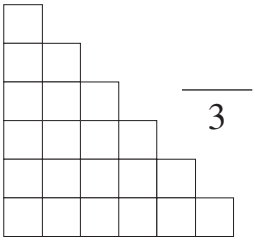
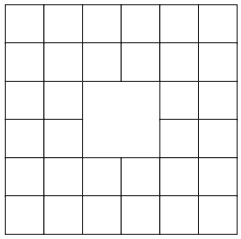
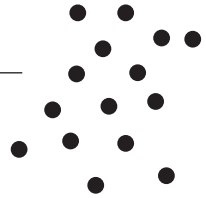


3



3



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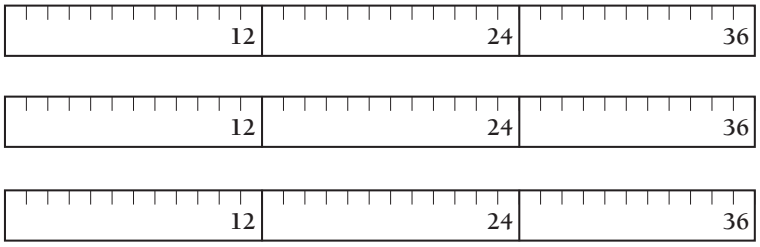
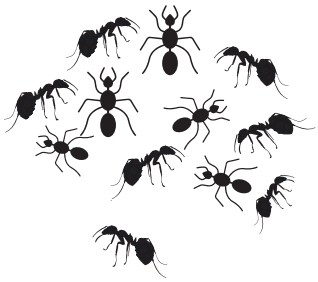


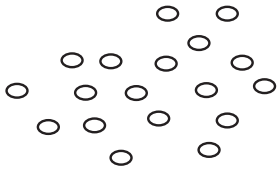
9

8

4



4



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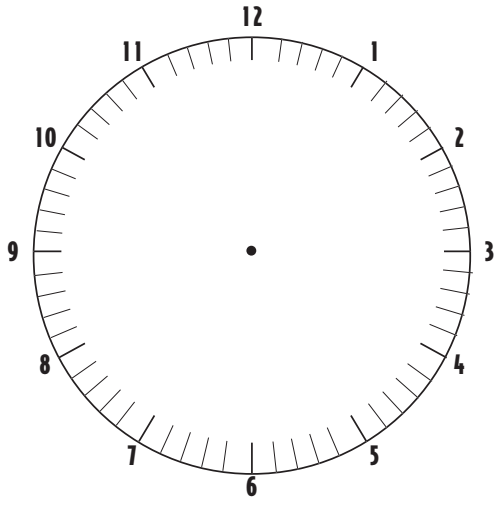

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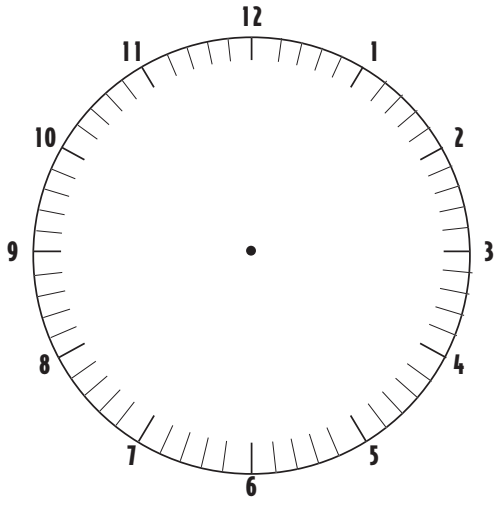
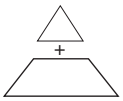
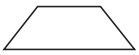
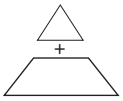


5

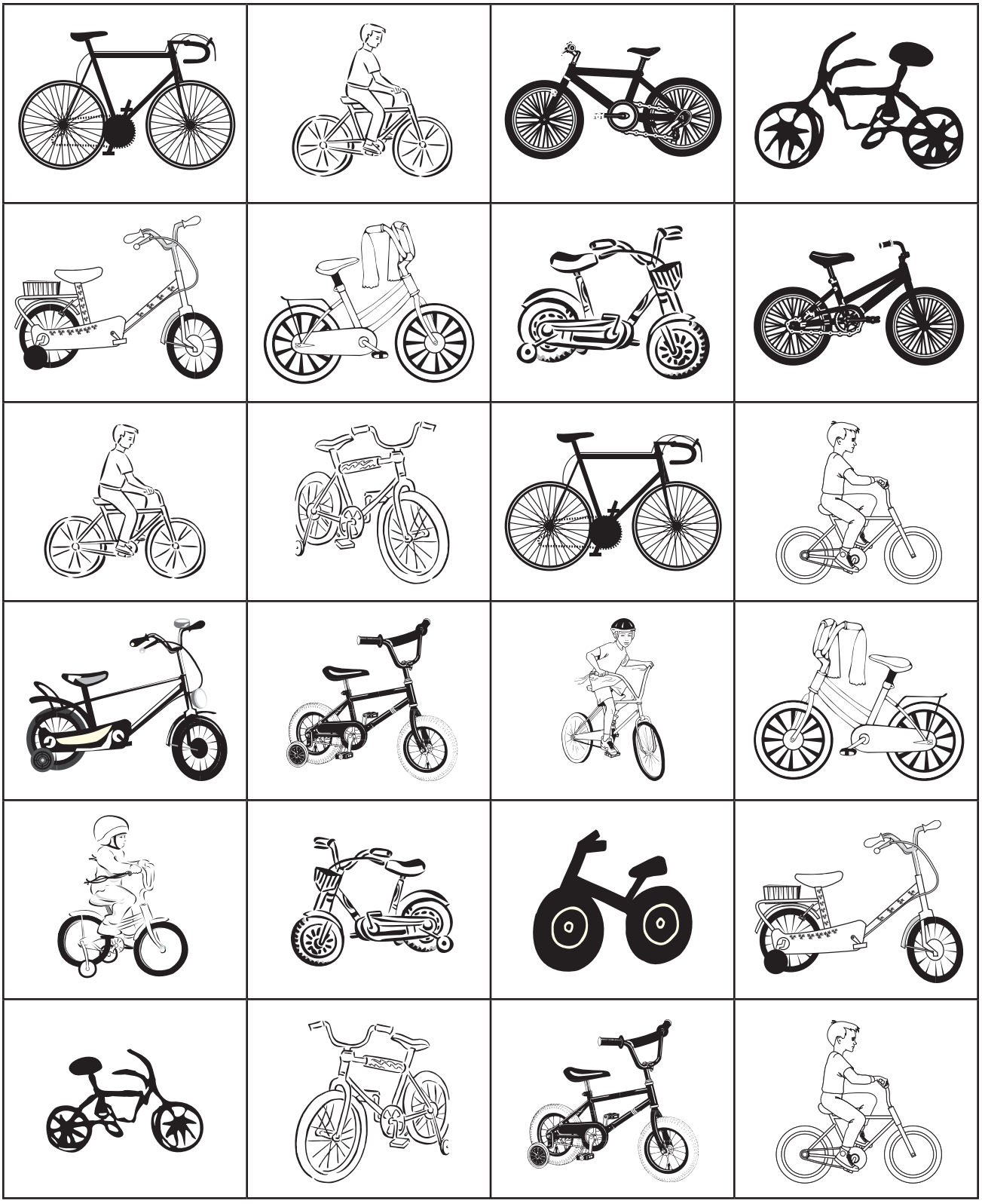
"If This Is...?

Challenge yourself to find the answers without using pattern blocks. Then if you need check with pattern blocks. Happy thinking!

If  is					
1/2					
1/4					
1/8					

If  is					
1					
2					
1/2					

BIKE Picture Cards



Name _____ Date _____

Milky Way Fraction Hunt

Write the appropriate parts of the words on the line to form a new word.

1. The first half of food + the last quarter of door.

_____

2. The last third of hat + the first 2/5 of heavy.

_____

3. The second 1/3 of office + the last 1/4 of door + the first 1/3 of street.

_____

4. The last half of go + the last 1/2 of done.

_____

5. The last 1/8 of elephant + the first 1/5 of order.

_____

6. The first 3/4 of fine + the last 3/4 of dish.

_____

7. The last 1/6 of cement + the first of 3/7 of history.

_____

8. The last half of bath + the finest 1/3 of end + the last 2/7 of require.

_____

9. The first 2/5 of water + the last 3/4 of fits.

_____

10. The last 1/6 of Glenda.

_____

11. The first 1/3 of principal + the first half of zero.

_____

12. The first 1/7 of instant + the first third of fat.

_____

13. The first 2/5 of young + the first 1/10 of understand.

_____

14. The first 1/4 of ugly + the first 1/5 of settlement.

_____

15. The first 1/4 of youthful + the last half of pour.

_____

16. The first 1/4 of hesitate + the last 2/3 of sad.

_____

17. The last 1/3 of rat + the first 2/5 of heart.

_____

18. The first 3/7 of mileage + the last 2/3 of sky.

_____

19. The first 1/5 of white + the last 1/3 of Friday.

_____

20. The last 1/4 of Meri + the first 1/5 of Susan.

_____

21. The first 3/5 of dirty + the last 3/7 of perfect + the first 2/5 of Lynda.

_____

22. The first 3/4 of bent + the last 2/3 of breath.

_____

23. The first 1/3 of Thomas + the first 1/8 of Endicott.

_____

24. The first 3/5 of sound + the last 2/9 of Aylsworth.

_____

25. The first quarter of positive + the first two thirds of Lee.

_____

26. The first 3/5 of quick + the second 1/4 of meat + the last 1/3 of patiently.

_____

27. The first third of get + the second fourth of Jody.

_____

28. The first half of loud + the last half of book.

_____

Write the clues in numerical order:

_____

_____

_____

The ANSWER KEY for the activity is: FOR THE FIRST ONE TO FINISH THIS THERE WAITS A PRIZE IF YOU USE YOUR HEAD THE MILKY WAY IS DIRECTLY BENEATH THE SOUTH POLE QUIETLY GO LOOK

BIKES

What is the whole unit that you are considering? _____

What fraction of the bikes are mountain bikes? _____

What fraction of the bikes have gears? _____

What fraction of the bikes have training wheels? _____

The boy style frames on the bikes represent _____ of the bikes.

How many of the handle bars have streamers on them. _____

How many of the bikes have fenders? _____

Make **two** true statements about the bike colors using the terms: **half, third, fourth, fifth, sixth, eighth, and/or tenth.**

1. _____

_____

_____

2. _____

_____

_____

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1. _____

_____

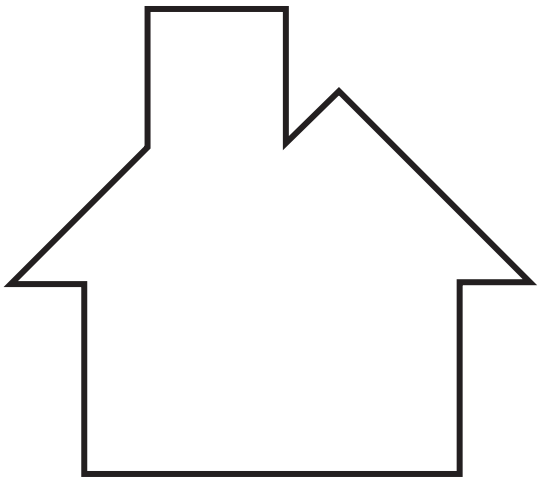
_____

2. _____

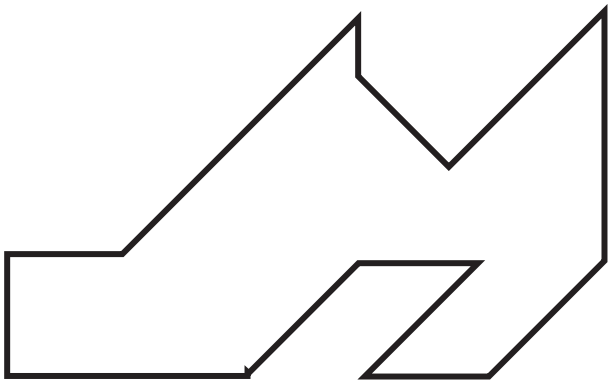
_____

_____

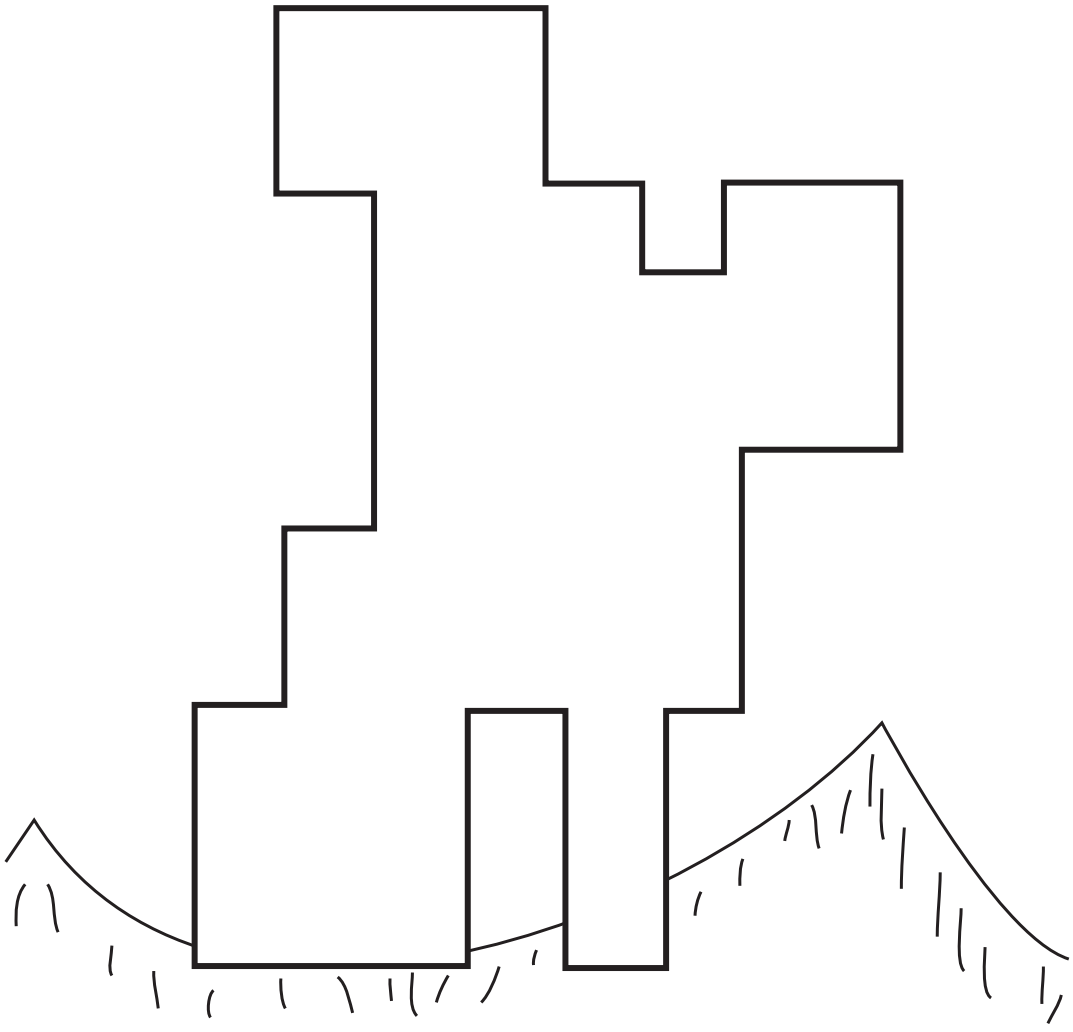
Tangram Puzzle



House



Shoe



One-on-the- Mountain

How Much Will It Hold??

List least to greatest, which solid has the largest volume.

Estimation	Actual after Measurement
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____
4. _____	4. _____
5. _____	5. _____
6. _____	6. _____
7. _____	7. _____
8. _____	8. _____

SHAPE	Volume Measurement 1 # ml	Volume Measurement 2 # ml
Large Square prism		
Small Square prism		
Small rectangular prism		
Square pyramid		
Large Rectangular prism		
Cone		
Large cylinder		
Sphere		

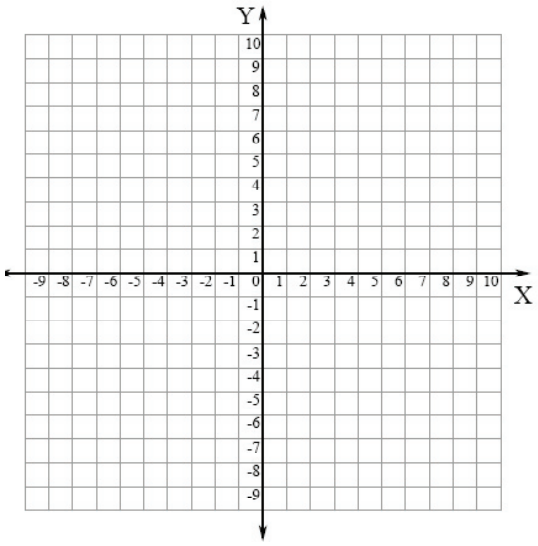
Type of material used for measurement:_____

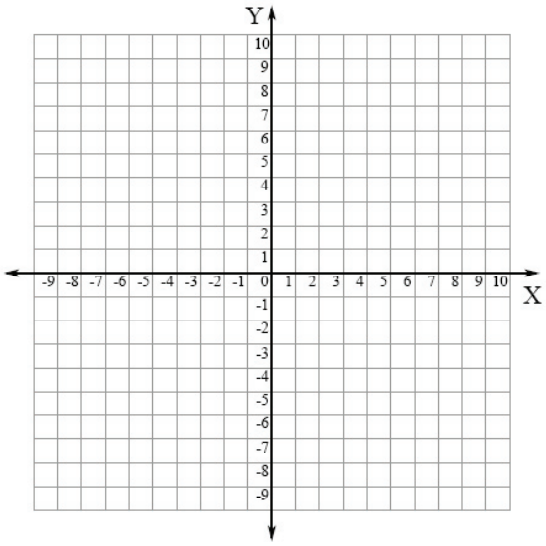
Look at results for possible relationships between different solids. Write and describe your findings below-

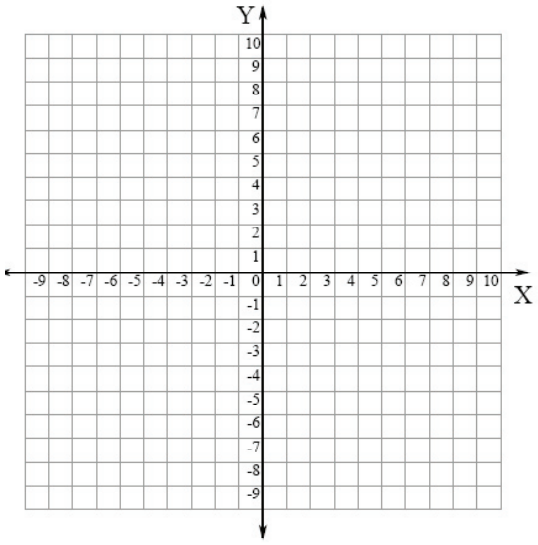
Tic Tac Toe

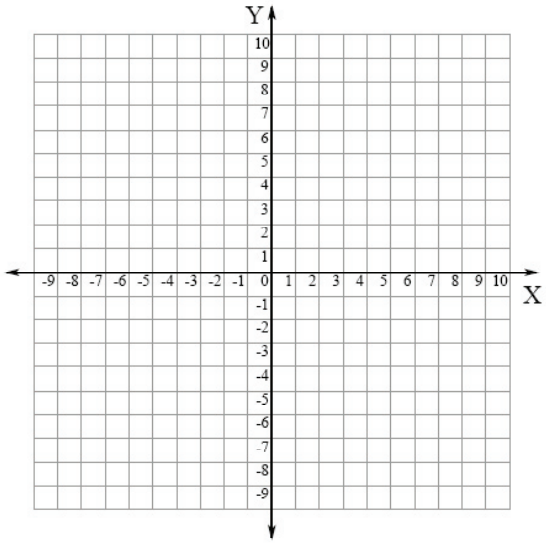
The object of the game is to get four X's or four O's in a row vertically, horizontally, or diagonally.

1. Play rock, paper, and scissors to decide who starts.
2. The winner begins the game, while the other picks X or O.
3. To start, write down the ordered pairs on paper. Point to that location. Other player checks to see if it is correct.
4. If you are right, place your mark. If you are wrong, you lose your turn.
5. Take turns until one player has four in a row.
6. Play four games, one in each quadrant.

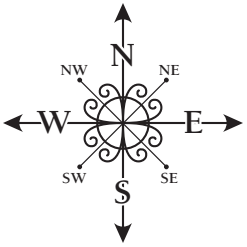


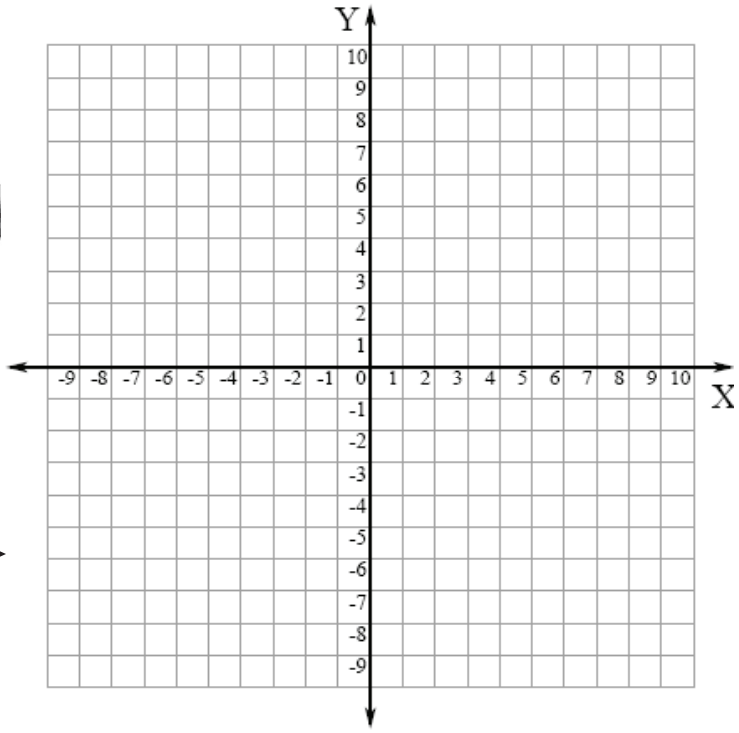






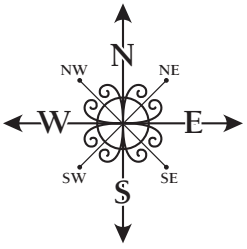
In Search of Buried Treasure

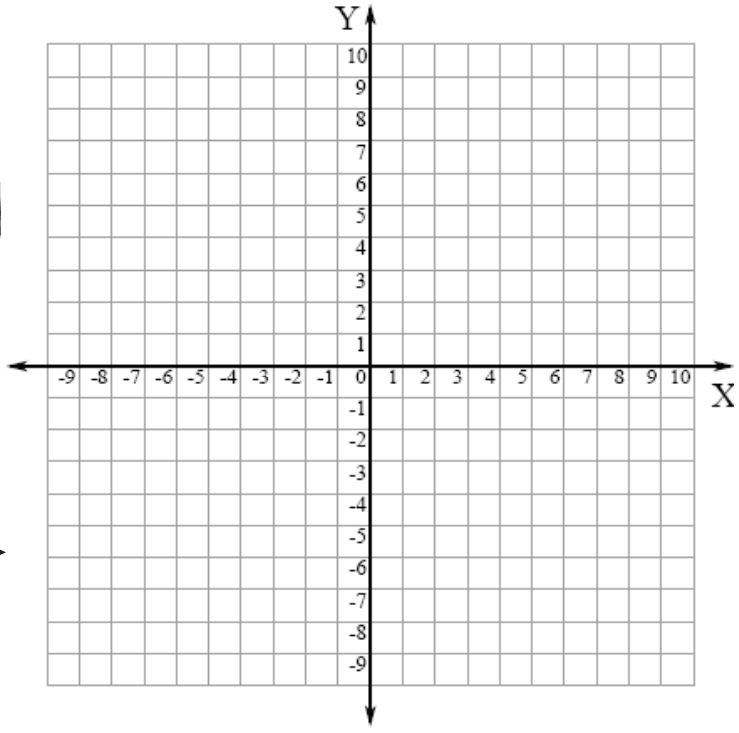




Guess	Clue

In Search of Buried Treasure





Guess	Clue

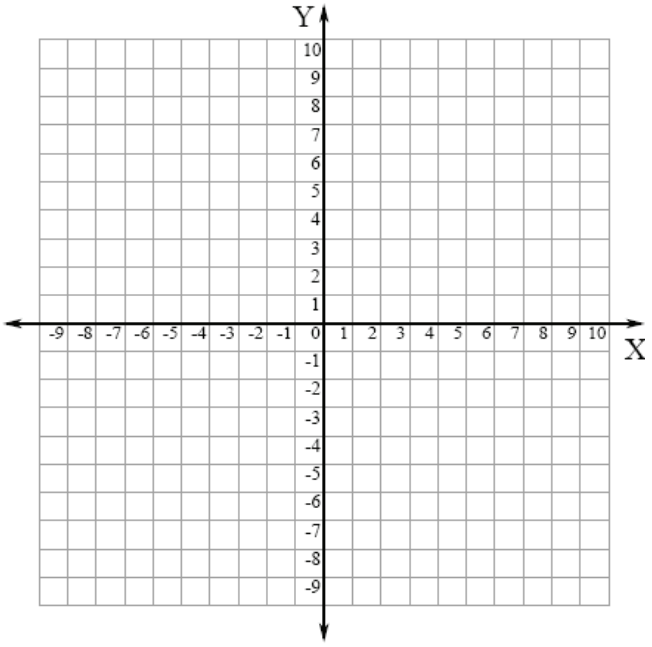
Space Wars

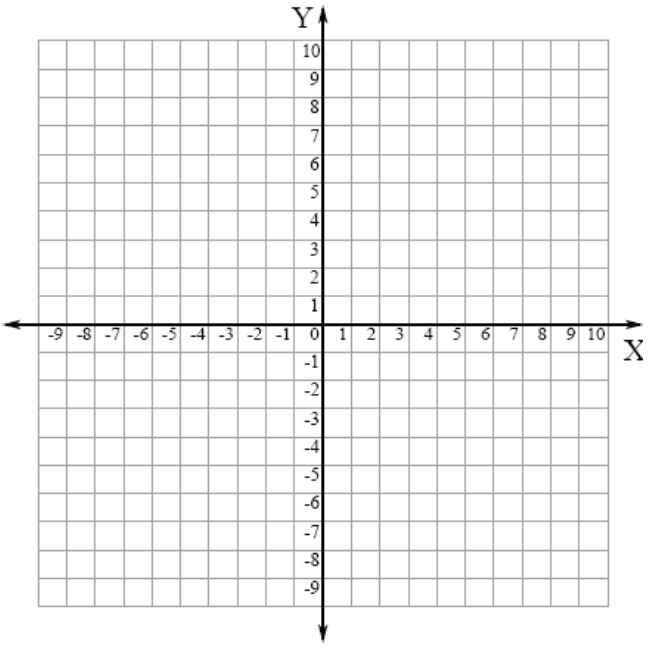
Object: Find and destroy each others' hidden spaceships.
Rules:

1. Players each mark (vertically or horizontally only) their "Fleet" of five ships on their "Air Space" on the coordinate plane. There must be a least one ship in each quadrant.
2. The ships should remain hidden from the opponent's view. A book works well.
3. Taking turns, players call out their "shots" attempting to get "hits" on the opponent's spaceships and destroy them.
4. "Hits" or "misses" should be marked on the other coordinate plane.
5. Use an X for a hit and an O for a miss.
6. A spaceship is destroyed when all points on the craft are hit.
7. A player wins when all 5 opponent's ships are destroyed.

Fleet

Length	Name
5 points	Death Star
4 points	Warbirds
3 points	Starship
3 poin11:37:56 AM	Fighters
2 points	Starbase





"Do You Feel Lucky?"

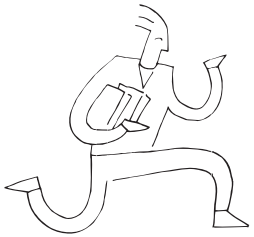
1. What strategies did you use in guessing which color you would draw?

2. Did the different values of the colors influence your guess? Why or why not?

3. How does knowing about probability increase your chances of winning?

4. How would the game change if you returned the tiles after each draw?

Escape from the Core



1. Before beginning the game, predict how many turns it will take to win the game _____.

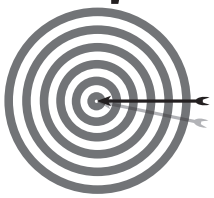
2. How close was your prediction? _____

3. How did knowing about probability affect your decisions on rotating the direction card?

4. How often did your experimental probability match the theoretical probability?

5. How could you change the rules to increase your probability of winning?

Zip, Zap, Zonk, You Win!



1. Before beginning the game as "The Guesser," predict how many turns it will take to guess the number? _____ How close was your prediction? _____

2. Before beginning the game as "Zap Master," predict how many turns it will take your partner to guess the number? _____ How close was your prediction? _____

3. As "The Guesser" what strategies did you use to select your numbers?

_____

_____

4. As the "Zap Master" what strategies did you use to pick your number?

_____

_____

5. How does knowing about probability increase your chances of winning?

_____

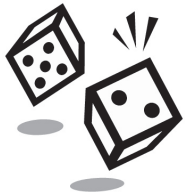
_____

6. How could you change the rules to make it more challenging?

_____

_____

Ya' Don't Know Beans



1. What strategies did you use in choosing which boxes to initial?

_____

_____

2. After you and your partner have placed your initials in the boxes, predict how many beans you will win._____ How close was your prediction? _____

3. On the next round, did you change your strategies in choosing where to place your initials? _____ Why or why not?

_____

_____

4. How does knowing about probability increase your chances of winning?

_____

_____

Station Rules

Station 1 Rules: "Escape from the Core"

1. All players place their markers in the center box.
2. The goal of the game is to be the first player to move their marker off the board.
3. On each turn, a player determines which way they want to rotate the Direction Card. This and the number rolled on the die will determine the direction moved for that turn.
4. Roll the die, and move in the direction indicated by the number on the Direction Card. Each player only moves 1 square (regardless of the number on the die).
5. Continue playing until the first player moves off the board.
6. The winning player scores 1 point for each victory.
7. Play again if there is time.
8. Respond in Math Journal.

Station 2 Rules: "Zip, Zap, Zonk, You Win!"

1. Each player gets a game board.
2. First player, "The Zap Master," thinks of a 2-digit number, writes it on scratch paper, and keeps it hidden from the other player.
3. The second player, "The Guesser", writes their guess on line # 1 of the game board.
4. "The Zap Master" puts an x in the correct clue column on line # 1. Clue guidelines:
   - Zip = "The Guesser" has nothing correct.
   - Zap = "The Guesser" has correct digit(s), but in the wrong position.
   - Zonk = "The Guesser" has one correct digit in the correct position.
   - You Win = "The Guesser" has guessed the correct number
5. "The Guesser" continues guessing numbers until the correct number is guessed.
6. Players then switch roles and continue playing.
7. Respond in Math Journal.

Station 3 Rules: "Ya' Don't Know Beans"

1. This game is for 2 players
2. Get a game board, "Ya' Don't Know Beans", 21 beans, pair of dice, and a pencil.
3. Each player rolls one die to determine who goes first (High number writes first)
4. Players take turns writing their initials in one box on the bottom until an <u>equal</u> number of boxes have been filled in.
5. Take turns rolling the dice, adding the sums, and placing a bean in that column until all 21 beans have been placed.
6. Each player then totals the number of beans placed in each of the columns with their initials. Player with the most beans wins.
7. Respond in Math Journal.

Station 4 Rules: "Do You Feel Lucky?"

1. Get a game board and a bag with 20 counters (10 of each color). Determine which color moves 2 spaces and which moves 3 spaces by writing in the blanks.
2. Decide which player will go first
3. Before drawing out a counter, predict which color you will draw. Movement guidelines:
   - An incorrect guess……..move one space
   - A correct guess (_color_)…….move two spaces
   - A correct guess (_color_)…….move three spaces
4. <u>Do not</u> return counters to the bag after drawing
5. First player to reach the center wins!
6. Respond in Math Journal.